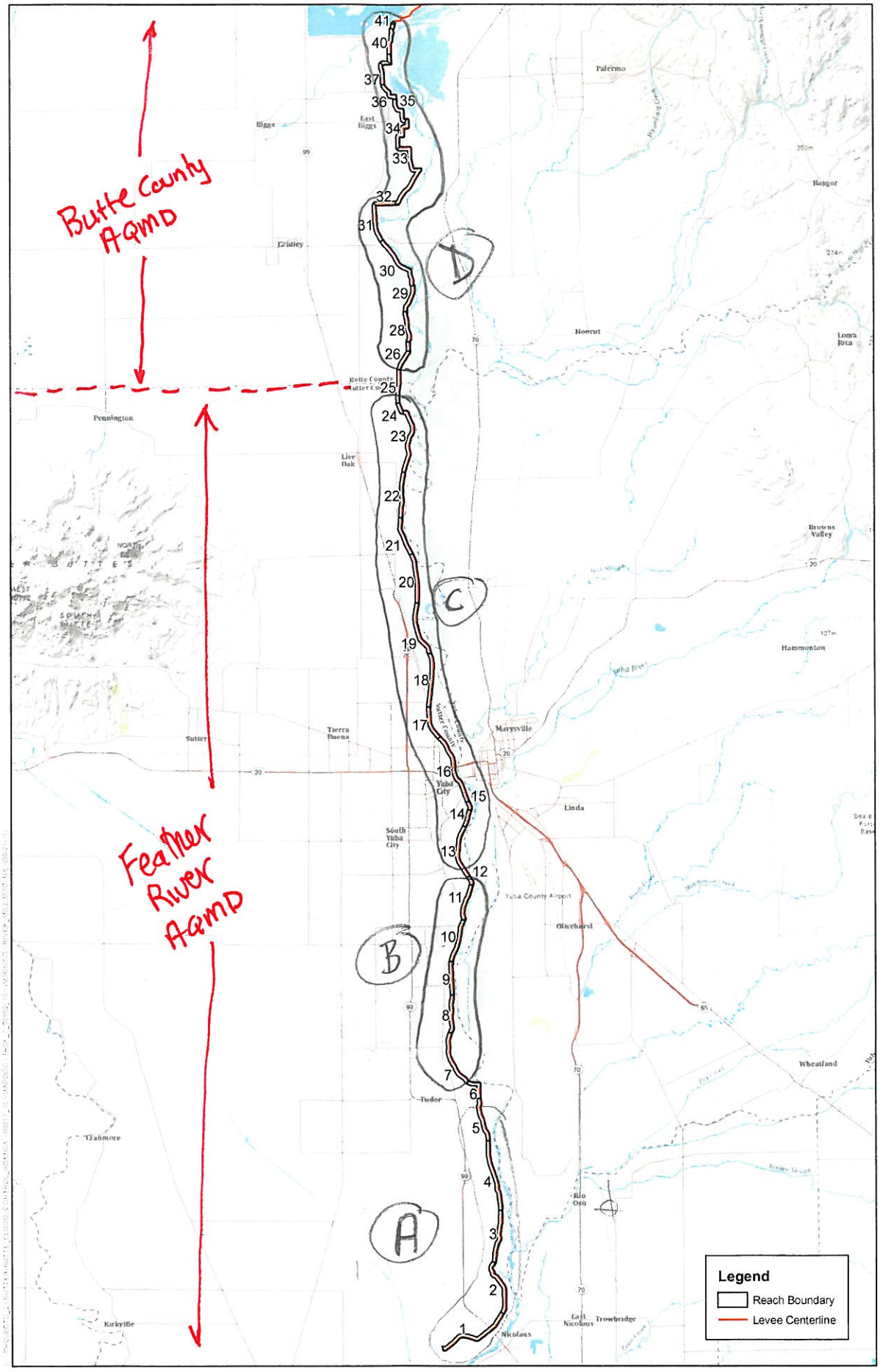
Appendix D

Final Air Quality Calculation Spreadsheets and Supporting Information

AIR QUALITY APPENDIX
CALCULATION SPREADSHEETS AND SUPPORTING INFORMATION



ICF INTERNATIONAL

Project Reach Boundaries

MEMORANDUM

TO: Mr. Mike Inamine, Sutter Butte Flood Control Agency

FROM: HDR/Wood Rodgers Design Team

DATE: January 17, 2012

SUBJECT: SBFCA, Feather River West Levee Project, Project Description for CEQA/NEPA Analysis, Version 2.0

INTRODUCTION

In 2010, the Sutter Butte Flood Control Agency (SBFCA) embarked on the Feather River West Levee (FRWL) Project. The project seeks to rehabilitate 44 miles of existing levee along the west bank of the Feather River through Sutter and Butte Counties. A geotechnical assessment of the levees has been completed and the potential mitigation measures to address the deficiencies in each reach has been analyzed by the design team. These alternatives are outlined in detail in the Project Pre-design Formulation Report (Reference 1). The design of the project is currently approaching the 60-percent level.

The purpose of this Memorandum is to provide the information requested by ICF International (Reference 3), for the purpose of preparing project CEQA/NEPA Analyses. Estimates of the quantity and duration of equipment usage, labor workforce, and materials necessary to construct each of the three project alternatives are provided within this Memorandum. Other information, including power consumption, estimate of the disturbed area, and other information requested in Reference No. 3 is also included. Version 2.0 of this project description addresses additional information requested by ICF/Jones and Stokes as discussed on Monday, January 9, 2012.

REFERENCES

1. HDR, Wood Rodgers, URS, and MHM, "Pre-design Formulation Report, Feather River West Levee – Segments 1 through 7, Sutter Butte Levee Rehabilitation Program, Sutter and Butte Counties, California," February 2011.

2. PBI, "Technical Memorandum, SBFCA Feather River West Levee Project, Preliminary Construction Project Prioritization Analysis," July 11, 2011.

3. ICF International, "Revised Data Requests for the Feather River West Levee Project EIS/EIR," September 30, 2011.

4. Wood Rodgers, Inc., SBFCA, "Feather River West Levee Project, Preliminary Assessment of Borrow Requirements and Potential Borrow Sites," August 12, 2011.

CONSTRUCTION PHASING

Outlined in Reference 2 are four projects corresponding to the likely construction contracts for construction of the overall project. The four projects, or Construction Contracts as referenced herein, and their respective areas for construction of the FRWL project, are identified in Table 1 below.

Table 1 – Construction Contracts and FRWL Reaches

Construction Contract	FRWL Reaches
A	2 Through 5
B	7 Through 11
C	13 Through 24
D	26 Through 41

It is noted that Reaches 6, 12, and 25 are no work reaches on the project. At the south end of the project, the work begins at Station 202+50, within Reach 2. Reach 1 is not currently a part of the Phase 1 Project.

ALTERNATIVES DESCRIPTION

For each of the Construction Contracts identified, there are three alternatives under consideration. The first alternative (Alternative 1) rehabilitates the levee primarily using cutoff walls such that the overall footprint of the levee is not expanded. This alternative is referred to within this memorandum as the "Minimized Footprint" alternative. The second alternative (Alternative 2) rehabilitates the levee using primarily seepage and stability berms, expanding the overall footprint of the existing levee. This alternative is referred to as the "Expanded Footprint" alternative. The third alternative (Alternative 3), rehabilitates the levee by selecting the lowest cost rehabilitation measure (whether a cutoff wall or a seepage berm) such that the overall cost of the project is minimized. This alternative is referred to in this memorandum as the "Optimized Footprint" alternative.

CONSTRUCTION SCHEDULE

Construction of the Project is anticipated to occur beginning in 2013 and continue through 2015. A total of four construction contracts are anticipated, issued in a sequence to match the priority ranking identified in Reference 2. Each of the contracts will be two years in duration. Table 2 below outlines the construction priority and years identified for construction.

Table 2 – Construction Priority and Years of Construction

Construction Contract	Years for Construction
C	2013 through 2014
D	2013 through 2014
B	2014 through 2015
A	2014 through 2015

For each construction season, the maximum window of work is anticipated to be May 1st through November 1st. This start date of construction corresponds to the end of the Giant Garter Snake (GGS) activity period, while November 1st marks the beginning of the flood season for the Sacramento River Flood Control Project. It may be the case that additional construction window restrictions on account of nesting raptors or early season (October) GGS activity may occur and are not accounted for in this analysis.

The construction of each contract is anticipated to occur in single 10 hour shifts, six days a week. An exception to this schedule is cutoff wall construction, which is anticipated to occur in two 10 hour shifts, (24-hour construction) six days a week. While production work will not occur between the two 10 hour shifts, equipment maintenance and preparations for the upcoming work shift will occur.

A construction schedule for each of the alternatives relating of each construction contract is included in Appendix A.

EQUIPMENT AND MANPOWER ESTIMATES

Within each project description outlined below, there are summary Tables for the equipment type, duration, and sequencing for each construction project alternative. The supporting calculations for these estimates are included as Appendix B of this memorandum.

POTENTIAL BORROW SITES

Up to eight potential borrow sites are identified within Reference 4 above for the Project. Location maps for the borrow areas within Yuba City and Live Oak are provided as Figures 1 and 2. It may be the case that additional borrow sites not currently identified are eventually identified and used as sources of borrow for this Project. For the purposes of this memorandum, it is assumed any additional sites are a similar distance to the work areas and require similar equipment and manpower to excavate, borrow, and haul material to the levee rehabilitation sites. The acreage of the primary borrow sites included in Reference 4, are as follows in Table 3 below:

Table 3 – Borrow Site Acreage

Borrow Site	Area, Acres
Yuba City North	28
Yuba City South	70
Live Oak North	34
Live Oak South	28
Live Oak East	13
Live Oak West	7
Caltrans Property	26

RIGHT-OF-WAY AND EASEMENTS

Throughout the project length, the State and/or local levee maintaining agencies hold various easements and fee rights to the land beneath and adjacent to the Feather River West Levee. Due to the age of the system, and the numerous projects to upgrade the levee system over the years, the land right vary significantly throughout the project. One objective of the project is to upgrade these rights so that the State and local maintaining agencies have appropriate and consistent land rights throughout the length to operate and maintain the levee system. To this end, SBFCA has coordinated with the Central Valley Flood Protection Board (CVFPB) and Department of Water Resources (DWR) to acquire the following rights-of-way for the project:

- Waterside: 15 feet
- Landside: 30 feet minimum, 40 feet where orchards or other continuous obstructions are not present.

Where the current rights beneath or adjacent to the levee are currently owned as an easement, the project will upgrade the rights to fee ownership.

For the waterside right-of-way, and the first 20 feet of the 30 feet to be obtained landward of the levee, existing trees and encroachments will be removed to the extent necessary to facilitate construction of the project and to support long term operation and maintenance of the project. It may be the case that some trees, structures, and other encroachments are not removed from the rights-of-way. These encroachments will be addressed on a case by case basis during final design of the project.

The outer ten feet of the landside easement will be granted in easement back to the existing landowner and will be allowed to be used for agricultural purposes following construction of the project.

Staging areas will only be provided within the right-of-way and easement limits described above. The contractor may reach agreements with landowners for additional staging locations outside of

these limits. Staging areas may be used by the contractor for storage of equipment and materials, project offices, employee parking, and other uses needed for construction of the project.

Cutoff wall construction requires temporary establishment of an on-site slurry batch plant that would occupy about 1 to 2 acres. Batch plants will be located at approximately 1-mile intervals along the levee. The batch plant site would likely contain tanks for water storage, bulk bag supplies of bentonite, bentonite and cement storage silos, a cyclone mixer, pumps, and two generators that meet air quality requirements. The site would also accommodate slurry tanks to store the blended slurries temporarily until they are pumped to the work sites. Slurry ingredients would be mixed with water at the batch plant and the mixture would be pumped from the tanks through pipes to the cutoff wall construction work sites. The batch plant would produce two different slurry mixes, one for trench stabilization and one for the soil backfill mix. Therefore, two slurry pipes or hoses, typically 4- or 6-inch high-density polyethelene pipes, would be laid on the ground and would extend to all work sites. An additional pipe may be used to supply water to the work sites.

MATERIALS DELIVERY AND OFF HAULING

Typical deliveries and off hauling for each project includes bentonite powder, used for making cutoff wall trench slurry and backfill, pipe delivery for irrigation pipe relocation and replacement, aggregate road surfacing, and demolition debris off hauling. For backfill of new pipelines crossing the levee, Controlled Low Strength Material (CLSM), otherwise referred to as light-weight concrete, is required to be placed to the pipeline's spring line. A table is included for each project alternative summarizing the total number of materials deliveries and off hauling associated with the project. The calculations for deliveries and debris hauling for encroachments is included as Appendix C.

PROJECT A, REACHES 1 THROUGH 5

Project A of the FRWL begins at Levee Station 202+50 near the intersection of the FRWL and Laurel Road, and continues north to the beginning of the improvements constructed, as part of the Star Bend Setback Levee project, Levee Station 478+68. The total length of the levee in this portion of the FRWL project is 27,618 linear feet.

Alternative 1 would construct a cutoff wall ranging between 30 feet and 127 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height with 2,900 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep soil mixing (DSM) method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. In addition to the cutoff wall, Alternative 1 would construct a 200-foot wide seepage berm for 2,268 feet. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction and seepage berm

construction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 1, including staging and construction easement areas, is 137.1 acres.

The crew size for Alternative 1 during the peak is estimated at 115-125 people working on two fronts, 10-hour shifts, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 4. The anticipated material quantities associated with this alternative is included in Table 5. The total number of anticipated trucks for materials delivery and off hauling is included in Table 6.

Table 4
Anticipated Equipment and Durations for Project A
Alternative 1 – Minimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	20 Days
	(2) Water Trucks	20 Days
	(4) Front-End Loaders	20 Days
	(2) Haul Trucks	20 Days
	(5) Pickup Trucks	20 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	20 Days
	(2) Elevating Scrapers	20 Days
	(1) Water Truck	20 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 15 days)	(3) Excavators	40 Days
	(15) Scrapers	40 Days
	(5) Vibratory Rollers	40 Days
	(3) Water Trucks	40 Days
	(7) Haul Trucks	40 Days
4. Cutoff Wall Construction (Lags 3. by 22 days)	(4) Hydraulic Excavators	60 Days
	(2) Front-End Loaders	60 Days
	(1) DSM Auger	60 Days
	(1) Extended Boom Pallet Loader	60 Days
	(3) 300 kW Generators	60 Days
	(2) Slurry Pumps	60 Days
	(5) Pickup Trucks	60 Days
	(3) Haul Trucks	60 Days
	(2) Water Trucks	60 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
5. Levee Reconstruction/ Seepage Berm Construction (Lags 4. by 25 days)	(20) Scrapers	60 Days
	(2) Motor Graders	60 Days
	(5) Vibratory Rollers	60 Days
	(3) Water Trucks	60 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	60 Days
	(2) Excavators	60 Days
	(2) Water Trucks	60 Days
	(50) Haul Trucks	60 Days
7. Utility Reconstruction	(2) Backhoes	100 Days
	(2) Front End Loaders	100 Days
	(2) Rubber Tire Crane	100 Days
	(3) Pickup trucks	100 Days
	(2) Water Trucks	100 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	22 Days
	(2) Vibratory Rollers	22 Days
	(2) Haul Trucks	22 Days
	(1) Water Truck	22 Days
	(2) Motor Graders	22 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	18 Days
10. Demobilization/Cleanup (Lags 9. by 5 days)	(1) Extended Boom Pallet Loader	18 Days
	(2) Haul Trucks	18 Days

Table 5
Anticipated Major Materials Quantities for Project A
Alternative 1 – Minimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	83.5 Acres
Levee Embankment Degrade	602,400 Cubic Yards
SB Cutoff Wall	1,457,000 Square Feet
Levee Embankment Fill	782,000 Cubic Yards
Borrow Site Excavation	244,000 Cubic Yards
Unsuitable Material Export	31,500 Cubic Yards
Class 2 Aggregate Surfacing	13,100 Tons

Table 6
Number of Trucks for Materials Delivery and Off Hauling – Project A, Alternative 1

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
89	425	8	60	26

Alternative 2 would construct an undrained seepage berm ranging between 100 feet and 300 feet in width along the landside toe of the levee. Additionally, an 8-foot high stability berm would be constructed along 20,817 feet of the project. Also, a shallow cutoff wall 20 feet in depth would be constructed along the levee centerline for 1,616 feet of the project. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by the conventional, long-reach excavator method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, seepage and stability berm construction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 259.1 acres.

The crew size for Alternative 2 during the peak is estimated at 195-205 people working one 10-hour shift, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 7. For a listing of the anticipated material quantities associated with this alternative, see Table 8. The total number of anticipated trucks for materials delivery and off hauling is included in Table 9.

Table 7
Anticipated Equipment and Durations for Project A,
Alternative 2 – Expanded Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(2) Haul Trucks	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	22 Days
	(4) Elevating Scrapers	22 Days
	(2) Water Truck	22 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
3. Levee Degrading/ Work Surface Construction (Follows 1.)	(1) Excavators	10 Days
	(2) Scrapers	10 Days
	(2) Vibratory Rollers	10 Days
	(1) Water Trucks	10 Days
	(2) Haul Trucks	10 Days
4. Cutoff Wall Construction (Follows 3.)	(2) Hydraulic Excavators	10 Days
	(1) Front-End Loaders	10 Days
	(1) Extended Boom Pallet Loader	10 Days
	(2) 300 kW Generators	10 Days
	(1) Slurry Pumps	10 Days
	(3) Pickup Trucks	10 Days
	(2) Haul Trucks	10 Days
	(1) Water Trucks	10 Days
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Lags 2. by 15 days)	(25) Scrapers	180 Days
	(5) Motor Graders	180 Days
	(2) Hydraulic Excavators	180 Days
	(5) Vibratory Rollers	180 Days
	(4) Water Trucks	180 Days
6. Borrow Site Excavation (Concurrent with 5.)	(4) Front-End Loaders	170 Days
	(4) Excavators	170 Days
	(4) Water Trucks	170 Days
	(85) Haul Trucks	170 Days
7. Utility Reconstruction	(2) Backhoes	115 Days
	(2) Rubber Tire Crane	115 Days
	(2) Front End Loaders	115 Days
	(3) Pickup trucks	115 Days
	(2) Water Trucks	115 Days
8. Levee Resurfacing (Follows 5.)	(1) Motor Graders	5 Days
	(1) Vibratory Rollers	5 Days
	(2) Haul Trucks	5 Days
	(1) Water Truck	5 Days
9. Hydroseeding (Follows 5.)	(2) Hydroseeding Trucks	20 Days
10. Demobilization/Cleanup (Lags 9. by 5 days)	(1) Extended Boom Pallet Loader	22 Days
	(2) Haul Trucks	22 Days

Table 8
Anticipated Major Materials Quantities for Project A,
Alternative 2 – Expanded Footprint Alternative

Description	Quantity
Clearing and Grubbing	183.1 Acres
Levee Embankment Degrade	16,500 Cubic Yards
SB Cutoff Wall	13,500 Square Feet
Levee Embankment Fill	1,373,000 Cubic Yards
Borrow Site Excavation	1,628,000 Cubic Yards
Unsuitable Material Export	75 Cubic Yards
Class 2 Aggregate Surfacing	1,425 Tons

Table 9
Number of Trucks for Materials Delivery and Off Hauling – Project A, Alternative 2

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
1	50	8	60	26

Alternative 3 would construct a cutoff wall ranging between 20 feet and 127 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep soil mixing (DSM) method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. In addition to the cutoff wall, Alternative 3 would construct a 100-foot wide seepage berm for 1,616 feet and a 200-foot wide seepage berm for 2,268 feet. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction and seepage berm construction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 3, including staging and construction easement areas, is 142.4 acres.

The crew size for Alternative 3 during the peak is estimated at 115-125 people working on two fronts, 10-hour shifts, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 10. For a listing of the anticipated material quantities associated with this alternative, see Table 11. The total number of anticipated trucks for materials delivery and off hauling is included in Table 12.

Table 10
Anticipated Equipment and Duration for Project A,
Alternative 3 – Optimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 15 days)	(3) Excavators	100 Days
	(15) Scrapers	100 Days
	(5) Vibratory Rollers	100 Days
	(3) Water Trucks	100 Days
	(7) Haul Trucks	100 Days
4. Cutoff Wall Construction (Lags 3. by 15 days)	(5) Hydraulic Excavators	60 Days
	(2) Front-End Loaders	60 Days
	(1) DSM Auger	30 Days
	(1) Extended Boom Pallet Loader	60 Days
	(4) 300 kW Generators	60 Days
	(2) Slurry Pumps	60 Days
	(5) Pickup Trucks	60 Days
	(3) Haul Trucks	60 Days
	(2) Water Trucks	60 Days
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Lags 4. by 25 days)	(20) Scrapers	60 Days
	(2) Motor Graders	60 Days
	(5) Vibratory Rollers	60 Days
	(3) Water Trucks	60 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	50 Days
	(2) Hydraulic Excavators	50 Days
	(2) Water Trucks	50 Days
	(50) Haul Trucks	50 Days
7. Utility Reconstruction	(2) Backhoes	130 Days
	(2) Rubber Tire Crane	130 Days
	(2) Front End Loaders	130 Days
	(3) Pickup trucks	130 Days
	(2) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
10. Demobilization/Cleanup (Lags 9. by 5 days)	(1) Extended Boom Pallet Loader	24 Days
	(2) Haul Trucks	24 Days

Table 11
Anticipated Major Materials Quantities for Project A, Alternative 3 – Optimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	87.2 Acres
Levee Embankment Degrade	548,000 Cubic Yards
SB Cutoff Wall	1,272,000 Square Feet
Levee Embankment Fill	759,700 Cubic Yards
Borrow Site Excavation	276,250 Cubic Yards
Unsuitable Material Export	25,750 Cubic Yards
Class 2 Aggregate Surfacing	10,000 Tons

Table 12
Number of Trucks for Materials Delivery and Off Hauling – Project A, Alternative 3

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
78	350	8	60	26

PROJECT B, REACHES 7 THROUGH 11

Project B of the FRWL begins at Levee Station 510+37, the end of the improvements constructed as part of the Star Bend Setback Levee project, and continues north Levee Station 830+00. The total length of the levee in this portion of the FRWL project is 31,963 linear feet. Three alternatives have been reviewed as part of the Feather River West Levee Pre-Design Formulation Report. Alternative 1 would construct a cutoff wall along the centerline of the existing levee to a varying depth and a seepage berm along a portion of the landside levee toe. Alternative 2 would construct seepage and stability berms along the landside toe of the levee and a shallow cutoff wall along a portion of the centerline of the levee. Alternative 3 is an optimized alternative, combining mitigation measures from both Alternative 1 and Alternative 2 to produce the most economically feasible project. For Project B, the most economically feasible project is

to construct a cutoff wall along the centerline of the existing levee. Therefore, Alternative 1 and Alternative 3 are the same for this project.

Alternative 1 would construct a cutoff wall ranging between 39 feet and 124 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height with 1,900 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep soil mixing (DSM) method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up. SBFCA will acquire a temporary construction easement equal to 50 feet from the existing levee toe or toe of the proposed seepage berm for construction of the levee improvements. An additional 20-foot easement will be obtained where required for the relocation of existing utilities. The total disturbed area for Alternative 1, including staging and construction easement areas, is 155.1 acres.

The crew size for Alternative 1 during the peak is estimated at 110-120 people working on two fronts, 10-hour shifts, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 13. For a listing of the anticipated material quantities associated with this alternative, see Table 14. The total number of anticipated trucks for materials delivery and off hauling is included in Table 15.

Table 13
Anticipated Equipment and Duration for Project B,
Alternative 1 – Minimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 14 days)	(3) Excavators	80 Days
	(15) Scrapers	80 Days
	(5) Vibratory Rollers	80 Days
	(3) Water Trucks	80 Days
	(7) Haul Trucks	80 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
4. Cutoff Wall Construction (Lags 3. by 14 days)	(4) Hydraulic Excavators	50 Days
	(2) Front-End Loaders	50 Days
	(2) DSM Auger	50 Days
	(1) Extended Boom Pallet Loader	50 Days
	(4) 300 kW Generators	50 Days
	(2) Slurry Pumps	50 Days
	(5) Pickup Trucks	50 Days
	(3) Haul Trucks	50 Days
	(2) Water Trucks	50 Days
5. Levee Reconstruction (Follows 4.)	(20) Scrapers	80 Days
	(2) Motor Graders	80 Days
	(5) Vibratory Rollers	80 Days
	(3) Water Trucks	80 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	80 Days
	(2) Hydraulic Excavators	80 Days
	(2) Water Trucks	80 Days
	(50) Haul Trucks	80 Days
7. Utility Reconstruction	(2) Backhoes	130 Days
	(2) Rubber Tire Crane	130 Days
	(2) Front End Loaders	130 Days
	(3) Pickup trucks	130 Days
	(2) Water Trucks	130 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	20 Days
	(2) Vibratory Rollers	20 Days
	(2) Haul Trucks	20 Days
	(1) Water Truck	20 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	20 Days
10. Demobilization/Cleanup (Lags 9. by 10 days)	(1) Extended Boom Pallet Loader	15 Days
	(2) Haul Trucks	15 Days

Table 14
Anticipated Major Materials Quantities for FRWL, Project B,
Alternative 1 – Minimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	94.1 Acres
Levee Embankment Degrade	931,900 Cubic Yards
SB Cutoff Wall	1,948,500 Square Feet
Levee Embankment Fill	1,086,500 Cubic Yards

Description	Quantity
Borrow Site Excavation	796,750 Cubic Yards
Unsuitable Material Export	520,250 Cubic Yards
Class 2 Aggregate Surfacing	12,000 Tons

Table 15
Number of Trucks for Materials Delivery and Off Hauling – Project B, Alternative 1

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
119	400	17	36	36

Alternative 2 would construct an undrained seepage berm ranging between 110 feet and 300 feet in width along the landside toe of the levee. Additionally, a stability berm approximately 9.5 feet tall would be constructed along 14,163 feet of the project. Also, a shallow cutoff wall ranging between 23 feet and 35 feet in depth would be constructed along the levee centerline for 17,800 feet of the project. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by the conventional, long-reach excavator method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. A portion of the existing Garden Highway will need to be removed and reconstructed to allow construction of the seepage berm. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, seepage and stability berm construction, borrow site excavation, utility relocation and reconstruction, roadway reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 331.8 acres.

The crew size for Alternative 2 during the peak is estimated at 190-200 people working one 10-hour shift, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 16. For a listing of the anticipated material quantities associated with this alternative, see Table 17. The total number of anticipated trucks for materials delivery and off hauling is included in Table 18.

Table 16
Anticipated Equipment and Duration for Project B,
Alternative 2 – Expanded Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	50 Days
	(4 Elevating Scrapers	50 Days
	(2) Water Truck	50 Days
3. Levee Degrading/ Work Surface Construction (Follows 1.)	(1) Excavators	22 Days
	(2) Scrapers	22 Days
	(2) Vibratory Rollers	22 Days
	(1) Water Trucks	22 Days
	(6) Haul Trucks	22 Days
4. Cutoff Wall Construction (Lags 3. by 15 days)	(4) Hydraulic Excavators	50 Days
	(1) Front-End Loaders	50 Days
	(1) Extended Boom Pallet Loader	50 Days
	(2) 300 kW Generators	50 Days
	(2) Slurry Pumps	50 Days
	(3) Pickup Trucks	50 Days
	(2) Haul Trucks	50 Days
	(1) Water Trucks	50 Days
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Lags 2. by 15 days)	(25) Scrapers	145 Days
	(5) Motor Graders	145 Days
	(5) Vibratory Rollers	145 Days
	(4) Water Trucks	145 Days
6. Borrow Site Excavation (Concurrent with 5.)	(4) Front-End Loaders	145 Days
	(2) Hydraulic Excavators	145 Days
	(4) Water Trucks	145 Days
	(85) Haul Trucks	145 Days
7. Utility Reconstruction	(2) Backhoes	130 Days
	(2) Rubber Tire Crane	130 Days
	(2) Front End Loaders	130 Days
	(3) Pickup trucks	130 Days
	(2) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
8. Roadway Reconstruction (Follows 5.)	(2) Motor Graders	40 Days
	(1) Paving Machine	40 Days
	(2) Vibratory Rollers	40 Days
	(4) Haul Trucks	40 Days
	(1) Water Truck	40 Days
9. Levee Resurfacing (Follows 5.)	(2) Motor Graders	20 Days
	(1) Vibratory Rollers	20 Days
	(1) Haul Trucks	20 Days
	(1) Water Truck	20 Days
10. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	20 Days
11. Demobilization/Cleanup (Lags 9. by 10 days)	(1) Extended Boom Pallet Loader	15 Days
	(2) Haul Trucks	15 Days

Table 17
Anticipated Major Materials Quantities for Project B, Alternative 2 – Expanded Footprint Alternative

Description	Quantity
Clearing and Grubbing	272.3 Acres
Levee Embankment Degrade	484,000 Cubic Yards
SB Cutoff Wall	504,500 Square Feet
Levee Embankment Fill	2,406,000 Cubic Yards
Borrow Site Excavation	2,334,500 Cubic Yards
Unsuitable Material Export	22,000 Cubic Yards
Class 2 Aggregate Surfacing	6,500 Tons

Table 18
Number of Trucks for Materials Delivery and Off Hauling – Project B, Alternative 2

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
31	225	17	36	36

Alternative 3 would construct a cutoff wall ranging between 39 feet and 124 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height with 1,900 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep soil mixing (DSM) method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. Work

for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 3, including staging and construction easement areas, is 155.1 acres.

The crew size for Alternative 3 during the peak is estimated at 110-120 people working on two fronts, 10-hour shifts, 2 shifts per day, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 19. For a listing of the anticipated material quantities associated with this alternative, see Table 20. The total number of anticipated trucks for materials delivery and off hauling is included in Table 21.

Table 19
Anticipated Equipment and Duration for Project B,
Alternative 3 – Optimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(8) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(4) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 14 days)	(3) Excavators	45 Days
	(15) Scrapers	45 Days
	(5) Vibratory Rollers	45 Days
	(3) Water Trucks	45 Days
	(7) Haul Trucks	45 Days
4. Cutoff Wall Construction (Lags 3. by 14 days)	(4) Hydraulic Excavators	80 Days
	(2) Front-End Loaders	80 Days
	(2) DSM Augers	30 Days
	(1) Extended Boom Pallet Loader	80 Days
	(4) 300 kW Generators	80 Days
	(2) Slurry Pumps	80 Days
	(5) Pickup Trucks	80 Days
	(3) Haul Trucks	80 Days
	(2) Water Trucks	80 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
5. Levee Reconstruction (Lags 4. by 21 days)	(20) Scrapers	85 Days
	(2) Motor Graders	85 Days
	(5) Vibratory Rollers	85 Days
	(3) Water Trucks	85 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Hydraulic Excavators	95 Days
	(2) Front-End Loaders	95 Days
	(2) Water Trucks	95 Days
	(50) Haul Trucks	95 Days
7. Utility Reconstruction	(2) Backhoes	130 Days
	(2) Rubber Tire Crane	130 Days
	(2) Front End Loaders	130 Days
	(5) Pickup trucks	130 Days
	(2) Water Trucks	130 Days
8. Levee Resurfacing (Lags 5. by 96 days)	(2) Motor Graders	22 Days
	(2) Vibratory Rollers	22 Days
	(2) Haul Trucks	22 Days
	(1) Water Truck	22 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	20 Days
10. Demobilization/Cleanup (Lags 9. by 10 days)	(1) Extended Boom Pallet Loader	18 Days
	(2) Haul Trucks	18 Days

Table 20
Anticipated Major Materials Quantities for Project B,
Alternative 3 – Optimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	94.1 Acres
Levee Embankment Degrade	931,900 Cubic Yards
SB Cutoff Wall	1,948,500 Square Feet
Levee Embankment Fill	1,086,500 Cubic Yards
Borrow Site Excavation	796,750 Cubic Yards
Unsuitable Material Export	520,250 Cubic Yards
Class 2 Aggregate Surfacing	12,000 Tons

Table 21
Number of Trucks for Materials Delivery and Off Hauling – Project B, Alternative 3

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
119	400	17	36	36

PROJECT C, REACHES 13 THROUGH 24

Project C begins at Levee Station 845+00, near the north end of the Shanghai Bend Setback Levee, and continues north to Levee Station 1623+86 (corresponding to Reaches 13 through 24). The total length of the levee in this portion of the FRWL project is 77,886 linear feet.

Three alternatives have been reviewed as part of the Feather River West Levee Pre-Design Formulation Report. Alternative 1 would include the flattening of the waterside levee slope, the construction of a cutoff wall along the centerline of the existing levee to a varying depth, and the infilling of depressions and ditches at the landside levee toe. Alternative 2 would include a combination of seepage and stability berms along the landside toe of the levee, relief wells along the landside toe of the levee and shallow cutoff walls along the centerline of the levee for portions of the project. Alternative 3 is an optimized alternative, combining mitigation measures from both Alternative 1 and Alternative 2 to produce the most economically feasible project.

All three alternatives will require special consideration at the locations where the 5th Street bridge, State Highway 20 bridge, and the Union Pacific Railroad (UPRR) cross the levee. At these locations, soil-cement-bentonite cutoff walls will be constructed by either the Trench Remixing, Deep (TRD), jet grouting, or steel sheet pile method to a depth of approximately 31 to 53 feet. All three methods have similar crew sizes and equipment impacts, which are summarized in the cutoff wall section of the estimated equipment and duration table below.

Alternative 1 would construct a cutoff wall ranging between 21 and 105 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded approximately 50% of its overall height with approximately 2,600 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional long-reach excavator or the deep mix method (DMM). After installation of the cutoff wall, the levee will be reconstructed to its original configuration. In addition to the cutoff wall, Alternative 1 would include approximately 11,150 feet of waterside slope flattening, approximately 5,100 feet of depression infill and approximately 1,500 feet of ditch lining. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction and seepage berm construction, relief well installation, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 1, including staging and construction easement areas, is 187.3 acres.

The crew size for Alternative 1 during the peak is estimated at 150-160 people working on three to four fronts, 10-hour shifts, 2 shifts per day for cutoff wall construction, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 22. For a listing of the anticipated material quantities associated with this alternative, see Table 23. The total number of anticipated trucks for materials delivery and off hauling is included in Table 24.

Table 22
Anticipated Equipment and Duration for Project C,
Alternative 1 – Minimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(4) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(2) Front-End Loaders	40 Days
	(4) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 7 days)	(3) Excavators	35 Days
	(14) Scrapers	35 Days
	(5) Vibratory Rollers	35 Days
	(4) Water Trucks	35 Days
	(7) Haul Trucks	35 Days
4. Cutoff Wall Construction (Lags 3. by 7 days)	(8) Hydraulic Excavators	60 Days
	(4) Front-End Loaders	60 Days
	(2) DSM Auger	60 Days
	(1) Extended Boom Pallet Loader	60 Days
	(6) 300 kW Generators	60 Days
	(4) Slurry Pumps	60 Days
	(6) Pickup Trucks	60 Days
	(3) Haul Trucks	60 Days
	(2) Water Trucks	60 Days
5. Levee Reconstruction/ Seepage Berm Construction (Lags 4. by 22 days)	(10) Scrapers	130 Days
	(2) Motor Graders	130 Days
	(5) Tractors with Discing Equipment	130 Days
	(5) Vibratory Rollers	130 Days
	(3) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	130 Days
	(2) Water Trucks	130 Days
	(75) Haul Trucks	130 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 23
Anticipated Major Materials Quantities for Project C, Alternative 1 – Minimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	187.3 Acres
Levee Embankment Degrade	882,800 Cubic Yards
SB Cutoff Wall	3,137,100 Square Feet
Levee Embankment Fill	1,410,000 Cubic Yards
Borrow Site Excavation	531,300 Cubic Yards
Unsuitable Material Export	253,100 Cubic Yards
Class 2 Aggregate Surfacing	40,600 Tons

Table 24
Number of Trucks for Materials Delivery and Off Hauling – Project C, Alternative 1

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
191	1500	31	160	104

Alternative 2 would construct an undrained seepage berm ranging between 70 feet and 300 feet in width along the landside toe of the levee. An 8- to 10-foot high stability berm would be constructed along approximately 24,200 feet of the project. A shallow cutoff wall 20 feet in depth would be constructed along the levee centerline for approximately 14,700 feet of the

project. Relief wells will be installed for approximately 37,400 feet of the project. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded by approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by the conventional, long-reach excavator method. After installation of the cutoff wall, the levee will be reconstructed to its original configuration. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, seepage and stability berm construction, relief well construction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 344.9 acres.

The crew size for Alternative 2 during the peak is estimated at 200-210 people working on two fronts, 10-hour shifts, 2 shifts per day for cutoff wall construction, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 25. For a listing of the anticipated material quantities associated with this alternative, see Table 26. The total number of anticipated trucks for materials delivery and off hauling is included in Table 27.

Table 25
Anticipated Equipment and Duration for Project C,
Alternative 2 – Expanded Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(13) Elevating Scrapers	30 Days
	(7) Water Trucks	30 Days
	(7) Front-End Loaders	30 Days
	(13) Pickup Trucks	30 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	60 Days
	(4) Elevating Scrapers	60 Days
	(2) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 4 days)	(3) Excavators	20 Days
	(14) Scrapers	20 Days
	(5) Vibratory Rollers	20 Days
	(4) Water Trucks	20 Days
	(7) Haul Trucks	20 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
4. Cutoff Wall Construction (Lags 3. by 7 days)	(4) Hydraulic Excavators	25 Days
	(2) Front-End Loaders	25 Days
	(1) DSM Auger	25 Days
	(1) Extended Boom Pallet Loader	25 Days
	(3) 300 kW Generators	25 Days
	(2) Slurry Pumps	25 Days
	(3) Pickup Trucks	25 Days
	(2) Haul Trucks	25 Days
	(1) Water Trucks	25 Days
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Lags 4. by 2 days)	(10) Scrapers	180 Days
	(5) Motor Graders	180 Days
	(5) Tractors with Discing Equipment	180 Days
	(5) Vibratory Rollers	180 Days
	(3) Water Trucks	180 Days
6. Borrow Site Excavation (Concurrent with 5.)	(4) Front-End Loaders	180 Days
	(4) Water Trucks	180 Days
	(75) Haul Trucks	180 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days
8. Levee Resurfacing (Follows 5.)	(4) Motor Graders	24 Days
	(4) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(2) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 26
Anticipated Major Materials Quantities for Project C,
Alternative 2 – Expanded Footprint Alternative

Description	Quantity
Clearing and Grubbing	344.9 Acres
Levee Embankment Degrade	385,000 Cubic Yards
SB Cutoff Wall	451,200 Square Feet
Levee Embankment Fill	2,518,400 Cubic Yards
Borrow Site Excavation	2,681,200 Cubic Yards

Description	Quantity
Unsuitable Material Export	322,900 Cubic Yards
Class 2 Aggregate Surfacing	35,900 Tons

Table 27
Number of Trucks for Materials Delivery and Off Hauling – Project C, Alternative 2

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
28	1,200	31	160	104

Alternative 3 would construct a cutoff wall ranging between 21 and 105 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded by approximately 50% of its overall height with approximately 2,600 feet of the levee being fully degraded. The cutoff wall would be constructed of soil-bentonite by either the conventional long-reach excavator or the deep mix method (DMM). After installation of the cutoff wall, the levee will be reconstructed to its original configuration. In addition to the cutoff wall, Alternative 3 would include relief wells for approximately, 8200 feet, approximately 11,150 feet of waterside slope flattening, approximately 5,100 feet of depression infill and approximately 1,500 feet of ditch lining. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction and seepage berm construction, relief well installation, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 3, including staging and construction easement areas, is 187.3 acres.

The crew size for Alternative 3 during the peak is estimated at 150-160 people working on three to four fronts, 10-hour shifts, 2 shifts per day for cutoff wall construction, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 28. For a listing of the anticipated material quantities associated with this alternative, see Table 29. The total number of anticipated trucks for materials delivery and off hauling is included in Table 30.

Table 28
Anticipated Equipment and Duration for Project C,
Alternative 3 – Optimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(4) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(2) Front-End Loaders	40 Days
	(4) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(2) Tractors with Discing Equipment	60 Days
	(2) Elevating Scrapers	60 Days
	(1) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Lags 1. by 7 days)	(3) Excavators	35 Days
	(14) Scrapers	35 Days
	(5) Vibratory Rollers	35 Days
	(4) Water Trucks	35 Days
	(7) Haul Trucks	35 Days
4. Cutoff Wall Construction (Lags 3. by 7 days)	(8) Hydraulic Excavators	60 Days
	(4) Front-End Loaders	60 Days
	(2) DSM Auger	60 Days
	(1) Extended Boom Pallet Loader	60 Days
	(6) 300 kW Generators	60 Days
	(4) Slurry Pumps	60 Days
	(6) Pickup Trucks	60 Days
	(3) Haul Trucks	60 Days
	(2) Water Trucks	60 Days
5. Levee Reconstruction/ Seepage Berm Construction (Lags 4. by 22 days)	(10) Scrapers	130 Days
	(2) Motor Graders	130 Days
	(5) Tractors with Discing Equipment	130 Days
	(5) Vibratory Rollers	130 Days
	(3) Water Trucks	130 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	130 Days
	(2) Water Trucks	130 Days
	(75) Haul Trucks	130 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 29
Anticipated Major Materials Quantities for Project C, Alternative 3 – Optimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	187.3 Acres
Levee Embankment Degrade	882,800 Cubic Yards
SB Cutoff Wall	3,175,000 Square Feet
Levee Embankment Fill	1,410,000 Cubic Yards
Borrow Site Excavation	531,300 Cubic Yards
Unsuitable Material Export	253,100 Cubic Yards
Class 2 Aggregate Surfacing	40,600 Tons

Table 30
Number of Trucks for Materials Delivery and Off Hauling – Project C, Alternative 3

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
193	1,500	31	160	104

PROJECT D, REACHES 26 THROUGH 41

Project D begins at Levee Station 1674+37 and continues north Levee Station 2368+00. The total length of the levee in this portion of the FRWL project is 69,363 linear feet.

Three alternatives have been reviewed as part of the Feather River West Levee Pre-Design Formulation Report. Alternative 1 would include the flattening of the waterside levee slope, the construction of a cutoff wall along the centerline of the existing levee to a varying depth, and the infilling of depressions and ditches at the landside levee toe. Alternative 2 would include a combination of seepage and stability berms along the landside toe of the levee, relief wells along the landside toe of the levee and shallow cutoff walls along the centerline of the levee for

portions of the project. In addition, Alternative 2 will include the filling of the existing canal adjacent to the levee in Reaches 26, 27, and 28 with water. This will require the construction of regulating structures within the canal to maintain the water level within the canal. Alternative 3 is an optimized alternative, combining mitigation measures from both Alternative 1 and Alternative 2 to produce the most economically feasible project.

All three alternatives will require construction of a cutoff wall at the East Gridley Road crossing. A 70-foot deep soil-cement-bentonite cutoff wall constructed by either the Trench Remixing, Deep (TRD), jet grouting, or steel sheet pile method. All three methods have similar crew sizes and equipment impacts, which are summarized in the cutoff wall section of the estimated equipment and duration table below.

Alternative 1 would construct a cutoff wall ranging between 18 feet and 97 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded by approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep mix method (DSM). After installation of the cutoff wall, the levee will be reconstructed to its original configuration, with some areas including the flattening of the landside slope. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 1, including staging and construction easement areas, is 145.4 acres.

The crew size for Alternative 1 during the peak is estimated at 150-160 people working on three fronts, 10-hour shifts, 2 shifts per day for cutoff wall construction, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 31. For a listing of the anticipated material quantities associated with this alternative, see Table 32. The total number of anticipated trucks for materials delivery and off hauling is included in Table 33.

Table 31
Anticipated Equipment and Duration for Project D,
Alternative 1 – Minimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(3) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(2) Front-End Loaders	40 Days
	(3) Pickup Trucks	40 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	60 Days
	(4) Elevating Scrapers	60 Days
	(2) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Follows 1.)	(3) Excavators	25 Days
	(14) Scrapers	25 Days
	(5) Vibratory Rollers	25 Days
	(3) Water Trucks	25 Days
	(7) Haul Trucks	25 Days
4. Cutoff Wall Construction (Lags 3. by 14 days)	(6) Hydraulic Excavators	75 Days
	(3) Front-End Loaders	75 Days
	(2) DSM Auger	75 Days
	(1) Extended Boom Pallet Loader	75 Days
	(5) 300 kW Generators	75 Days
	(3) Slurry Pumps	75 Days
	(5) Pickup Trucks	75 Days
	(3) Haul Trucks	75 Days
	(2) Water Trucks	75 Days
5. Levee Reconstruction (Lags 4. by 22 days)	(10) Scrapers	90 Days
	(5) Motor Graders	90 Days
	(5) Tractors with Discing Equipment	90 Days
	(5) Vibratory Rollers	90 Days
	(3) Water Trucks	90 Days
6. Borrow Site Excavation (Concurrent with 5.)	(3) Front-End Loaders	90 Days
	(3) Water Trucks	90 Days
	(75) Haul Trucks	90 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 32
Anticipated Major Materials Quantities for Project D,
Alternative 1 – Minimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	145.4 Acres
Levee Embankment Degrade	433,200 Cubic Yards
SB Cutoff Wall	3,239,100 Square Feet
Levee Embankment Fill	1,065,300 Cubic Yards
Borrow Site Excavation	330,100 Cubic Yards
Unsuitable Material Export	14,000 Cubic Yards
Class 2 Aggregate Surfacing	43,300 Tons

Table 33
Number of Trucks for Materials Delivery and Off Hauling – Project D, Alternative 1

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
197	1,500	44	275	76

Alternative 2 would construct an undrained seepage berm ranging between 50 feet and 300 feet in width along the landside toe of the levee. A 4- to 10-foot-tall stability berm would be constructed along approximately 38,600 feet of the project. Approximately 1,300 feet of the existing levee will need to be removed and reconstructed with a zoned filter at the base in combination with a seepage berm. Approximately 15,100 feet of canal will be infilled. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, seepage and stability berm construction, borrow site excavation, utility relocation and reconstruction, roadway reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 241.1 acres.

The crew size for Alternative 2 during the peak is estimated at 150-160 people working one 10-hour shift, six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 34. For a listing of the anticipated material quantities associated with this alternative, see Table 35. The total number of anticipated trucks for materials delivery and off hauling is included in Table 36.

Table 34
Anticipated Equipment and Duration for Project D,
Alternative 2 – Expanded Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(5) Elevating Scrapers	40 Days
	(3) Water Trucks	40 Days
	(3) Front-End Loaders	40 Days
	(5) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	60 Days
	(4) Elevating Scrapers	60 Days
	(2) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (N/A	No Task	No Task
4. Cutoff Wall Construction (N/A)	No Task	No Task
5. Levee Reconstruction/ Seepage and Stability Berm Construction (Follows 2.)	(10) Scrapers	185 Days
	(2) Motor Graders	185 Days
	(2) Tractors with Discing Equipment	185 Days
	(5) Vibratory Rollers	185 Days
	(3) Water Trucks	185 Days
6. Borrow Site Excavation (Concurrent with 5.)	(2) Front-End Loaders	185 Days
	(2) Water Trucks	185 Days
	(75) Haul Trucks	185 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days
8. Levee Resurfacing (Follows 6.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	15 Days
	(2) Haul Trucks	15 Days

Table 35
Anticipated Major Materials Quantities for Project D,
Alternative 2 – Expanded Footprint Alternative

Description	Quantity
Clearing and Grubbing	241.1Acres
Levee Embankment Degrade	0 Cubic Yards
SB Cutoff Wall	0 Square Feet
Levee Embankment Fill	1,363,700 Cubic Yards
Borrow Site Excavation	601,500 Cubic Yards
Unsuitable Material Export	29,000 Cubic Yards
Class 2 Aggregate Surfacing	43,300 Tons

Table 36
Number of Trucks for Materials Delivery and Off Hauling – Project D, Alternative 2

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
89	1,500	44	275	76

Alternative 3 would construct a cutoff wall ranging between 18 feet and 97 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall and to maintain stability of the levee, the levee will be degraded by approximately 50% of its overall height. The cutoff wall would be constructed of soil-bentonite by either the conventional, long-reach excavator or the deep mix method (DSM). After installation of the cutoff wall, the levee will be reconstructed to its original configuration except in those locations where the levee slopes will be flattened. Approximately 1,300 feet of levee would be degraded and reconstructed with a 5 to 1 slope (horizontal to vertical). Approximately 9,500 feet of the landside levee slope will be flattened where the existing canal is adjacent to the levee. Work for this alternative is to include levee stripping, clearing and grubbing, borrow site preparation, levee degrading, cutoff wall installation, levee reconstruction, borrow site excavation, utility relocation and reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 3, including staging and construction easement areas, is 145.4 acres.

The crew size for Alternative 3 during the peak is estimated at 150-160 people working on three fronts, 10-hour shifts, 2 shifts per day cutoff wall construction only, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 37. For a listing of the anticipated material quantities associated with this alternative, see Table 38. The total number of anticipated trucks for materials delivery and off hauling is included in Table 39.

Table 37
Anticipated Equipment and Duration for Project D,
Alternative 3 – Optimized Footprint Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(3) Elevating Scrapers	40 Days
	(2) Water Trucks	40 Days
	(2) Front-End Loaders	40 Days
	(3) Pickup Trucks	40 Days
2. Borrow Site Preparation (Concurrent with 1.)	(4) Tractors with Discing Equipment	60 Days
	(4) Elevating Scrapers	60 Days
	(2) Water Truck	60 Days
3. Levee Degrading/ Work Surface Construction (Follows 1.)	(3) Excavators	25 Days
	(14) Scrapers	25 Days
	(5) Vibratory Rollers	25 Days
	(3) Water Trucks	25 Days
	(7) Haul Trucks	25 Days
4. Cutoff Wall Construction (Lags 3. by 14 days)	(6) Hydraulic Excavators	75 Days
	(3) Front-End Loaders	75 Days
	(2) DSM Auger	75 Days
	(1) Extended Boom Pallet Loader	75 Days
	(5) 300 kW Generators	75 Days
	(3) Slurry Pumps	75 Days
	(5) Pickup Trucks	75 Days
	(3) Haul Trucks	75 Days
	(2) Water Trucks	75 Days
5. Levee Reconstruction (Lags 4. by 22 days)	(10) Scrapers	90 Days
	(5) Motor Graders	90 Days
	(5) Tractors with Discing Equipment	90 Days
	(5) Vibratory Rollers	90 Days
	(3) Water Trucks	90 Days
6. Borrow Site Excavation (Concurrent with 5.)	(3) Front-End Loaders	90 Days
	(3) Water Trucks	90 Days
	(75) Haul Trucks	90 Days
7. Utility Reconstruction	(1) Hydraulic Excavator	130 Days
	(1) Haul Trucks	130 Days
	(2) Pickup Trucks	130 Days
	(1) Water Trucks	130 Days

Construction Phase	Number of Each Equipment Type	Duration of Use
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	24 Days
	(2) Vibratory Rollers	24 Days
	(2) Haul Trucks	24 Days
	(1) Water Truck	24 Days
9. Hydroseeding (Concurrent with 8.)	(2) Hydroseeding Trucks	24 Days
	(2) Pickup Trucks	24 Days
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	20 Days
	(2) Haul Trucks	20 Days

Table 38
Anticipated Major Materials Quantities for Project D,
Alternative 3 – Optimized Footprint Alternative

Description	Quantity
Clearing and Grubbing	145.4 Acres
Levee Embankment Degrade	433,200 Cubic Yards
SB Cutoff Wall	3,239,100 Square Feet
Levee Embankment Fill	1,065,300 Cubic Yards
Borrow Site Excavation	330,100 Cubic Yards
Unsuitable Material Export	14,000 Cubic Yards
Class 2 Aggregate Surfacing	43,300 Tons

Table 39
Number of Trucks for Materials Delivery and Off Hauling – Project D Alternative 3

Bentonite	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
197	1,500	44	275	76

CUTOFF WALL GAP CLOSURES AND SPECIAL CROSSINGS

Three reaches of the Feather River West Levee, Reaches 14, 15, and 16, have had cutoff walls constructed along the approximate levee centerline. However, the projects skipped two major bridge crossings, the 5th Street bridge at Station 1007+00 and State Highway 20 bridge at Station 1025+20, creating gaps in the cutoff wall. In addition, there are two other crossings that require special consideration for the cutoff wall construction, the Union Pacific Railroad (UPRR) crossing at Station 1131+00 and the East Gridley Road at Station 1902+00.

As part of the technical memorandum titled "SBFCA, Fether River West Levee Rehabilitation Project, Alternatives Cost Analysis for Cutoff Walls at 5th Street, State Highway 20, UPRR, and

East Gridley Road," three alternatives have been reviewed for these locations. Alternative 1 would construct an SCB cutoff wall by the Trench Remixing, Deep (TRD) Method. Alternative 2 would construct a cutoff wall by jet grouting using a mixture of cement and bentonite. Alternative 3 would construct a cutoff wall utilizing sheet piling.

Alternative 1 would construct a cutoff wall ranging between 40 feet and 70 feet in depth along the centerline of the levee. To facilitate construction of the cutoff wall, the levee would be degraded to create an adequate working platform for the TRD machine. Additionally, the existing roadways and railroad tracks would be removed and the existing bases would be graded to provide a working platform. The cutoff wall would be constructed of soil-cement-bentonite utilizing the TRD machine. After installation of the cutoff wall, the existing levee, roadway, and railroad tracks would be reconstructed to their original configuration. Work for this alternative is to include levee stripping, clearing and grubbing, roadway demolition, railroad track removal, levee degrading, cutoff wall installation, levee reconstruction, roadway reconstruction, railroad track replacement, utility reconstruction, levee resurfacing, hydroseeding, and demobilization and clean-up.

The total disturbed area for Alternative 1, including staging and construction easement areas, is 1.1 acres.

The crew size for Alternative 1 during the peak is estimated at 25-30 people working on one front, 12-hour shift, 1 shift per day, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 40. For a listing of the anticipated material quantities associated with this alternative, see Table 41. The total number of anticipated trucks for materials delivery and off hauling is included in Table 42.

Table 40
Anticipated Equipment and Duration for Cutoff Wall Gap Closures and Special Crossings, Alternative 1 – SCB Cutoff Wall by TRD Method Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Clearing and Grubbing/ Stripping	(2) Elevating Scrapers	4 Days
	(1) Water Trucks	4 Days
	(1) Front-End Loaders	4 Days
	(4) Haul Trucks	4 Days
	(2) Pickup Trucks	4 Days
2. Borrow Site Preparation (Concurrent with 1.)	(1) Tractors with Discing Equipment	1 Day
	(1) Elevating Scrapers	1 Day
	(1) Water Truck	1 Day

Construction Phase	Number of Each Equipment Type	Duration of Use
3. Levee Degrading/ Work Surface Construction (Lags 1. by 1 day)	(1) Excavators	4 Days
	(1) Scrapers	4 Days
	(2) Vibratory Rollers	4 Days
	(1) Water Trucks	4 Days
	(4) Haul Trucks	4 Days
4. Cutoff Wall Construction (Lags 3. by 1 day)	(1) Front-End Loaders	15 Days
	(1) TRD Machine	15 Days
	(1) Extended Boom Pallet Loader	15 Days
	(1) 300 kW Generators	15 Days
	(2) Pickup Trucks	15 Days
	(2) Haul Trucks	15 Days
	(1) Water Trucks	15 Days
5. Levee Reconstruction (Lags 4. by 25 days)	(1) Scrapers	15 Days
	(2) Motor Graders	15 Days
	(2) Vibratory Rollers	15 Days
	(1) Water Trucks	15 Days
6. Borrow Site Excavation (Concurrent with 5.)	(1) Scrapers	4 Days
	(1) Front-End Loaders	4 Days
	(1) Water Trucks	4 Days
	(4) Haul Trucks	4 Days
7. Utility Reconstruction	(2) Backhoes	10 Days
	(2) Front End Loaders	10 Days
	(2) Rubber Tire Crane	10 Days
	(3) Pickup trucks	10 Days
	(1) Water Trucks	10 Days
8. Levee Resurfacing (Follows 5.)	(2) Motor Graders	15 Days
	(2) Vibratory Rollers	15 Days
	(2) Haul Trucks	15 Days
	(1) Water Truck	15 Days
9. Hydroseeding (Follows 8.)	(1) Hydroseeding Trucks	1 Day
10. Demobilization/Cleanup (Follows 9.)	(1) Extended Boom Pallet Loader	1 Day
	(2) Haul Trucks	1 Day

Table 41
Anticipated Major Materials Quantities for
Cutoff Wall Gap Closures and Special Crossings,
Alternative 1 – SCB Cutoff Wall by TRD Method Alternative

Description	Quantity
Clearing and Grubbing	1.1 Acres
Levee Embankment Degrade	7,420 Cubic Yards
SB Cutoff Wall	58,140 Square Feet
Levee Embankment Fill	8,900 Cubic Yards
Borrow Site Excavation	1,490 Cubic Yards
Class 2 Aggregate Base	210 Tons
Asphalt Concrete Paving	50 Tons

Table 42
Number of Trucks for Materials Delivery and Off Hauling
Cutoff Wall Gap Closures and Special Crossings Alternative 1

Bentonite	Asphalt Concrete	Aggregate Surfacing	Pipe Material	Demolition Debris	CLSM Backfill
4	3	10	3	10	3

Alternative 2 would construct a cutoff wall ranging between 40 feet and 85 feet in depth along the centerline of the levee by jet grouting. A trench would be excavated to handle grouting spoils brought to the surface during the operation requiring removal of the existing roadway surfaces. The cutoff wall would be constructed using a mixture of cement and bentonite. After installation of the cutoff wall, the spoils trench would be backfilled and the existing roadway surface reconstructed. Work for this alternative is to include roadway demolition, trenching, cutoff wall installation, trench backfilling and compacting, roadway reconstruction, levee resurfacing, and demobilization and clean-up.

The total disturbed area for Alternative 2, including staging and construction easement areas, is 1.0 acres.

The crew size for Alternative 2 during the peak is estimated at 10-15 people working on one front, 12-hour shift, 1 shift per day, and six days a week. For a listing of the anticipated equipment and construction durations for this work, see Table 43. For a listing of the anticipated material quantities associated with this alternative, see Table 44. The total number of anticipated trucks for materials delivery and off hauling is included in Table 45.

Table 43
Anticipated Equipment and Duration for Cutoff Wall Gap Closures and Special Crossings, Alternative 2 – Jet Grouting Method Alternative

Construction Phase	Number of Each Equipment Type	Duration of Use
1. Roadway Demolition/ Levee Trenching	(1) Excavator	4 Days
	(1) Water Trucks	4 Days
	(2) Haul Trucks	4 Days
	(2) Pickup Trucks	4 Days
2. Cutoff Wall Construction (Lags 1. by 1 day)	(1) Front-End Loaders	50 Days
	(1) Jet Grouting Machine	50 Days
	(1) Extended Boom Pallet Loader	50 Days
	(1) 300 kW Generators	50 Days
	(2) Pickup Trucks	50 Days
	(2) Haul Trucks	50 Days
	(1) Water Trucks	50 Days
3. Levee Reconstruction (Lags 2. by 5 days)	(1) Excavator	4 Days
	(1) Pickup Truck	4 Days
	(1) Water Trucks	4 Days
4. Levee Resurfacing (Follows 3.)	(1) Vibratory Roller	4 Days
	(1) Water Trucks	4 Days
	(2) Haul Trucks	4 Days
5. Demobilization/Cleanup (Follows 4.)	(1) Extended Boom Pallet Loader	1 Day
	(2) Haul Trucks	1 Day

Table 44
Anticipated Major Materials Quantities for Cutoff Wall Gap Closures and Special Crossings, Alternative 1 – SCB Cutoff Wall by TRD Method Alternative

Description	Quantity
Levee Trenching	1,140 Feet
Jet Grout Cutoff Wall	65,320 Square Feet
Trench Backfill	460 Cubic Yards
Class 2 Aggregate Base	170 Tons
Asphalt Concrete Paving	20 Tons

Table 45
Number of Trucks for Materials Delivery and Off Hauling
Cutoff Wall Gap Closures and Special Crossings Alternative 2

Bentonite	Asphalt Concrete	Aggregate Surfacing
4	1	1

Alternative 1 Equipment Assumptions

Equipment	Project A										Project B										Project C										Project D									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aerial Lifts																																								
Air Compressors																																								
Bore/Drill Rigs				1										1										2										2						
Cement and Mortar Mixers				2										2										4										3						
Concrete/Industrial Saws																																								
Cranes							2										2																							
Crawler Tractors																																								
Crushing/Proc. Equipment																																								
Excavators			3	4		2							3	4		2							3	8			1						3	6			1			
Forklifts																																								
Generator Sets				3										4										6										5						
Graders					2			4							2			2							2				2						5			2		
Off-Highway Tractors		2										2										2			5							4			5				
Off-Highway Trucks									2										2										2									2	
Other Construction Equipment				1																																				
Other General Industrial Equipment																																								
Other Material Handling Equipment																																								
Pavers																																								
Paving Equipment																																								
Plate Compactors																																								
Pressure Washers																																								
Pumps																																								
Rollers			5		5			2					5		5			2					5		4			2					5		5			2		
Rough Terrain Forklifts										1				1						1				1						1				1						1
Rubber Tired Dozers																																								
Rubber Tired Loaders	4			2	0	2	2				4			2		2	2				2			4		2					2			3		3				
Scrapers	8	2	15		20						8	2	15		20						4	2	14		10						3	4	14		10					
Signal Boards																																								
Skid Steer Loaders																																								
Surfacing Equipment																																								
Sweepers/Scrubbers																																								
Tractors/Loaders/Backhoes							2										2																							
Trenchers																																								
Welders																																								
Water Trucks	2	1	3	2	3	2	2	1	0	0	2	1	3	2	3	2	2	1	0	0	2	1	4	2	3	2	1	1	0	0	2	2	3	2	3	3	1	1	0	0

Workers (trips/day)	**A**	**B**	**C**	**D**	**P?**
Number	79.2	75.9	102.3	102.3	All
Distance (mi)	30	30	30	30	All

Trucks (trips/2 years)	**A**	**B**	**C**	**D**	**P?**
Unsuitable Soil Disposal	2625	43354	21083	1166.7	1, 3
Bentonite	89	119	191	197	4
Aggregate Surfacing	425	400	1500	1500	8
Pipe Material	8	17	31	44	5
Demolition Debirs	60	36	160	275	10
CLSM Backfill	26	36	104	76	5
Borrow Fill	20333	66396	44250	27500	6
Distance (mi)	7	7	7	7	

Grading	**A**	**B**	**C**	**D**
Acres (2 years)	84	94	187	145
Acres (1 year)	42	47	94	73
Acres (1 year Clearing Phase)	35	40	80	62
Acres (1 year Clearing Phase/day)	2	2	4	3

	Per Year				Per Day (yr 1)				Per Day (yr 2)			
Trucks (trips/2 years)	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
Unsuitable Soil Disposal	1312.5	21677	10542	583.33	33	361	264	17	33	361	301	19
Bentonite	44.5	59.5	95.5	98.5	1.3	1.2	2.7	2.2	1.8	1.7	3.8	3.3
Aggregate Surfacing	212.5	200	750	750	18	20	63	63	21	25	63	63
Pipe Material	4	8.5	15.5	22	0.1	0.2	0.2	0.5	0.2	0.2	0.2	0.5
Demolition Debirs	30	18	80	137.5	3	3	8	14	3	2	8	14
CLSM Backfill	13	18	52	38	0.4	0.5	1	1	1	0.5	1	1
Borrow Fill	10167	33198	22125	13750	290	830	340	306	407	830	340	306

Acres (1 year Borrow Ex Phase)	6	7	14	11
Acres (1 year Borrow Ex Phase/day)	0.2	0.2	0.2	0.2

Alternative 2 Equipment Assumptions

Equipment	Project A										Project B										Project C										Project D									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	Road	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aerial Lifts																																									
Air Compressors																																									
Bore/Drill Rigs				1																					1																
Cement and Mortar Mixers				1										2											2																
Concrete/Industrial Saws																																									
Cranes							2																																		
Crawler Tractors																																									
Crushing/Proc. Equipment																																									
Excavators			1	2	2	4							1	4		2	2							3	4			1									1				
Forklifts																																									
Generator Sets				2										2											3																
Graders					5										5			2								5			4												
Off-Highway Tractors		4										4											4			5							4			2				
Off-Highway Trucks									2											2										2									2		
Other Construction Equipment				1																																				
Other General Industrial Equipment																																								
Other Material Handling Equipment																																								
Pavers																																								
Paving Equipment																		1																						
Plate Compactors																																								
Pressure Washers																																								
Pumps																																								
Rollers			2		5								2		5			2						5		5			4												
Rough Terrain Forklifts										1				1							1				1						1										1
Rubber Tired Dozers											4																													
Rubber Tired Loaders	4	0		1		4	2							1		4	2					7			2		4					3					2			
Scrapers	8	4	2		25						8	4	2		25							13	4	14		10						5	4			10				
Signal Boards																																								
Skid Steer Loaders																																								
Surfacing Equipment																																								
Sweepers/Scrubbers																																								
Tractors/Loaders/Backhoes							2										2																							
Trenchers																																								
Welders																																								
Water Trucks	2	2	2	1	4	4	2		0	0	2	2	1	1	4	4	2	1		0	0	7	2	4	1	3	4	1	2	0	0	3	2			3	2	1		0	0

Workers (trips/day)	**A**	**B**	**C**	**D**	**P?**
Number	132	128.7	135.3	102.3	All
Distance (mi)	30	30	30	30	All

		Per Year				Per Day (yr 1)				Per Day (yr 2)				
Trucks (trips/2 years)	**P?**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	
Unsuitable Soil Disposal	1, 3	6.25	1833.3	26908	2416.7	3	917	13454	1208	0.1	29	673	60	0	31	448	60	
Bentonite	4	1	31	28	197	0	16	14	0		0.5	0.9			0.8	1.4		
Aggregate Surfacing	8	50	225	1200	1500	0	113	600	0		6	50			6	50		Assigned to roadway
Pipe Material	5	8	17	31	44	4	9	16	22	0.0	0.1	0.1	0.2	0.0	0.2	0.2	0.2	
Demolition Debirs	10	60	36	160	275	30	18	80	138	3	2	8	14	3	2	8	14	
CLSM Backfill	5	26	36	104	76	13	18	52	38	0.1	0.2	0.5	0.4	0.1	0.3	1	0.4	
Borrow Fill	6	135667	194542	223433	50125	67833.3	97270.8	111717	25062.5	754	1057	1016	269	848	1769	1596	272	
Distance (mi)		7	7	7	7													

Grading	**A**	**B**	**C**	**D**
Acres (2 years)	183.1	272.3	344.9	241.1
Acres (1 year)	91.55	136.15	172.45	120.55
Acres (1 year Clearing Phase)	78	116	147	102
Acres (1 year Clearing Phase/day)	4	6	15	5

Acres (1 year Borrow Ex Phase)	14	20	26	18
Acres (1 year Borrow Ex Phase/day)	0.2	0.2	0.2	0.2

Alternative 3 Equipment Assumptions

Equipment	Project A										Project B										Project C										Project D									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Aerial Lifts																																								
Air Compressors																																								
Bore/Drill Rigs				1										2										2										2						
Cement and Mortar Mixers				2										2										4										3						
Concrete/Industrial Saws																																								
Cranes							2										2																							
Crawler Tractors																																								
Crushing/Proc. Equipment																																								
Excavators			3	5		2							3	4		2							3	8			1						3	6			1			
Forklifts																																								
Generator Sets				4										4										6										5						
Graders					2			2							2			2							2			2						5			2			
Off-Highway Tractors		2										2										2			5							4			5					
Off-Highway Trucks									2										2										2										2	
Other Construction Equipment				0																																				
Other General Industrial Equipment																																								
Other Material Handling Equipment																																								
Pavers																																								
Paving Equipment																																								
Plate Compactors																																								
Pressure Washers																																								
Pumps																																								
Rollers			5		5			2					5		5			2					5		5			2					5		5			2		
Rough Terrain Forklifts				1						1				1						1				1						1				1					1
Rubber Tired Dozers											4																													
Rubber Tired Loaders	4			2		2	2							2		2	2				2			4		2					2			3		3				
Scrapers	8	2	15		20						8	2	15		20						4	2	14		10	0					3	4	14		10					
Signal Boards																																								
Skid Steer Loaders																																								
Surfacing Equipment																																								
Sweepers/Scrubbers																																								
Tractors/Loaders/Backhoes							2										2																							
Trenchers																																								
Welders																																								
Water Trucks	2	1	3	2	3	2	2	1	0	0	2	1	3	2	3	2	2	1	0	0	2	1	4	2	3	2	1	1	0	0	2	2	3	2	3	3	1	1	0	0

Workers (trips/day)	**A**	**B**	**C**	**D**	**P?**
Number	79.2	75.9	102.3	102.3	All
Distance (mi)	30	30	30	30	All

		Per Year				Per Day (yr 1)				Per Day (yr 2)			
Trucks (trips/2 years)	**P?**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
Unsuitable Soil Disposal	1, 3	1072.9	21677	10546	583.33	15	482	264	29	15	542	301	29
Bentonite	4	39	59.5	96.5	98.5	1	1	3	2	2	2	4	4
Aggregate Surfacing	8	175	200	750	750	15	17	63	63	15	20	63	63
Pipe Material	5	4	8.5	15.5	22	0.1	0.2	0.2	0.4	0.2	0.2	0.2	0.4
Demolition Debirs	10	30	18	80	137.5	2	2	8	14	2	2	8	14
CLSM Backfill	5	13	18	52	38	0.4	0.4	1	1	1	0.5	1	1
Borrow Fill	6	11510	33198	22138	13754	460	604	341	229	460	830	341	229
Distance (mi)		7	7	7	7								

Grading	**A**	**B**	**C**	**D**
Acres (2 years)	87.2	94.1	187.3	145.4
Acres (1 year)	43.6	47.05	93.65	72.7
Acres (1 year Clearing Phase)	37	40	80	62
Acres (1 year Clearing Phase/day)	2	2	4	6

Acres (1 year Borrow Ex Phase)	7	7	14	11
Acres (1 year Borrow Ex Phase/day)	0.3	0.1	0.2	0.2

Alternative 1 Construction Schedule and Daily Output

Construction Phase	Project A																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	14.8	71.9	192.1	27.4	7.4	20.0	10.9	6.7	4.2	17314.0	5/15/2015	6/4/2015	20	0.9	14.57	71.67	186.8	27.2	7.211	20.0	10.7	6.577	4.2	17290
2. Borrow Site Preparation	5/15/2014	6/14/2014	30	1.4	6.3	46.4	50.8	2.5	2.5	0.0	2.1	2.1	0.0	8940.3	5/15/2015	6/14/2015	30	1.4	5.934	43.34	48.99	2.46	2.46	0	2.017	2.017	0	8939.98
3. Levee Degrading/ Work Surface Construction	6/12/2014	7/2/2014	20	0.9	26.7	126.2	330.7	13.9	13.9	0.0	12.7	12.7	0.0	29072.8	6/12/2015	7/2/2015	20	0.9	26.27	126	321.9	13.54	13.54	0	12.4	12.4	0	29045.5
4. Cutoff Wall Construction	7/14/2014	8/18/2014	35	1.6	6.0	34.7	63.6	3.1	3.1	0.0	2.9	2.9	0.0	6914.7	7/14/2015	8/8/2015	25	1.1	5.804	34.57	61.09	2.972	2.972	0	2.73	2.73	0	6938.25
5. Levee Reconstruction/ Seepage Berm Construction	8/13/2014	9/17/2014	35	1.6	35.0	159.8	422.7	18.0	18.0	0.0	16.5	16.5	0.0	35040.6	8/13/2015	9/7/2015	25	1.1	34.53	159.8	413.3	17.59	17.59	0	16.18	16.18	0	35065.2
6. Borrow Site Excavation	8/13/2014	9/17/2014	35	1.6	4.5	23.1	117.7	5.2	3.2	2.0	2.9	2.5	0.4	17846.0	8/13/2015	9/7/2015	25	1.1	5.05	25.48	141.8	5.8	3.774	2	3.2	2.787	0.4	23792.5
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	5.3	42.2	37.9	1.9	1.9	0.0	1.5	1.5	0.0	7961.5	7/14/2015	9/17/2015	65	3.0	5.491	39.16	40.91	2.308	2.308	0	1.876	1.876	0	7962.9
8. Levee Resurfacing	10/1/2014	10/13/2014	12	0.5	5.4	17.7	56.6	3.1	3.1	0.0	2.8	2.8	0.0	4225.8	9/17/2015	9/27/2015	10	0.5	5.37	17.69	56.39	3.091	3.091	0	2.807	2.807	0	4370.57
9. Hydroseeding	10/1/2014	10/13/2014	12	0.5	4.6	35.3	28.1	1.5	1.5	0.0	1.1	1.1	0.0	7548.1	9/17/2015	9/23/2015	6	0.3	4.268	32.33	26.93	1.427	1.427	0	1.067	1.067	0	7550.13
10. Demobilization/Cleanup	10/17/2014	10/27/2014	10	0.5	0.3	2.1	4.1	0.2	0.2	0.0	0.2	0.2	0.0	531.0	9/25/2015	10/5/2015	10	0.5	0.274	2.127	3.915	0.197	0.197	0	0.176	0.176	0	529.348

Construction Phase	Project B																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	17.7	84.7	297.6	29.9	9.9	20.0	12.7	8.5	4.2	34654.3	5/15/2015	6/4/2015	20	0.9	17.06	82.67	282	29.5	9.482	20.0	12.3	8.115	4.2	34441.3
2. Borrow Site Preparation	5/15/2014	6/14/2014	30	1.4	6.2	45.2	50.7	2.5	2.5	0.0	2.1	2.1	0.0	8744.1	5/15/2015	6/14/2015	30	1.4	5.847	42.35	48.89	2.439	2.439	0	2.008	2.008	0	8743.77
3. Levee Degrading/ Work Surface Construction	6/12/2014	7/22/2014	40	1.8	29.6	139.0	436.2	16.4	16.4	0.0	14.5	14.5	0.0	46413.1	6/12/2015	7/22/2015	40	1.8	28.75	137	417.1	15.81	15.81	0	13.94	13.94	0	46196.7
4. Cutoff Wall Construction	7/14/2014	9/2/2014	50	2.3	6.2	36.1	63.2	3.2	3.2	0.0	3.0	3.0	0.0	7114.7	7/14/2015	8/18/2015	35	1.6	5.879	35.99	60.36	3.034	3.034	0	2.787	2.787	0	7138.32
5. Levee Reconstruction/ Seepage Berm Construction	8/13/2014	9/22/2014	40	1.8	35.0	159.9	422.8	18.0	18.0	0.0	16.5	16.5	0.0	35051.2	8/13/2015	9/22/2015	40	1.8	34.52	159.8	413.2	17.59	17.59	0	16.18	16.18	0	35039.1
6. Borrow Site Excavation	8/13/2014	9/22/2014	40	1.8	9.3	44.2	291.4	9.4	7.4	2.0	5.9	5.4	0.4	46376.7	8/13/2015	9/22/2015	40	1.8	8.253	39.66	264.5	6.7	6.7	2	5.2	4.769	0.4	45897.9
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	5.2	41.0	37.8	1.9	1.9	0.0	1.5	1.5	0.0	7765.4	7/14/2015	9/17/2015	65	3.0	5.403	38.17	40.8	2.287	2.287	0	1.867	1.867	0	7766.69
8. Levee Resurfacing	10/8/2014	10/18/2014	10	0.5	3.2	10.8	35.3	1.9	1.9	0.0	1.7	1.7	0.0	2986.8	10/8/2015	10/16/2015	8	0.4	3.177	10.85	35.81	1.896	1.896	0	1.702	1.702	0	3235.66
9. Hydroseeding	10/8/2014	10/18/2014	10	0.5	4.5	34.2	28.0	1.4	1.4	0.0	1.1	1.1	0.0	7352.0	10/8/2015	10/16/2015	8	0.4	4.181	31.34	26.83	1.406	1.406	0	1.059	1.059	0	7353.92
10. Demobilization/Cleanup	10/22/2014	10/28/2014	6	0.3	0.4	2.6	7.7	0.3	0.3	0.0	0.2	0.2	0.0	1112.2	10/20/2015	10/28/2015	8	0.4	0.357	2.495	7.105	0.273	0.273	0	0.228	0.228	0	1104.19

Construction Phase	Project C																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	6/4/2013	20	0.9	10.8	49.8	187.3	46.6	6.6	40.0	13.9	5.6	8.3	21795.4	5/15/2014	6/4/2014	20	0.9	9.894	47.04	187.7	45.91	5.915	40	13.25	4.934	8.32	23720.1
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	7.5	58.5	54.7	2.8	2.8	0.0	2.3	2.3	0.0	10312.1	5/15/2014	6/14/2014	30	1.4	6.936	54.15	51.67	2.677	2.677	0	2.145	2.145	0	10313.3
3. Levee Degrading/ Work Surface Construction	5/24/2013	6/13/2013	20	0.9	29.2	132.2	408.0	16.4	16.4	0.0	14.6	14.6	0.0	39738.9	5/26/2014	6/10/2014	15	0.7	27.5	129.4	397.9	15.19	15.19	0	13.47	13.47	0	41659.8
4. Cutoff Wall Construction	6/4/2013	7/9/2013	35	1.6	11.7	64.4	123.1	6.2	6.2	0.0	5.7	5.7	0.0	12857.2	6/4/2014	6/29/2014	25	1.1	10.84	64.14	114.5	5.611	5.611	0	5.154	5.154	0	12903.8
5. Levee Reconstruction/ Seepage Berm Construction	7/4/2013	9/7/2013	65	3.0	36.3	160.0	441.8	18.8	18.8	0.0	17.3	17.3	0.0	35086.4	7/3/2014	9/6/2014	65	3.0	34.99	159.9	422.9	17.97	17.97	0	16.53	16.53	0	35077.6
6. Borrow Site Excavation	7/4/2013	9/7/2013	65	3.0	5.3	25.0	133.7	6.1	4.1	2.0	3.2	3.2	0.4	19379.3	7/3/2014	9/6/2014	65	3.0	5.344	24.95	133.7	6.146	4.146	2	3.658	3.242	0.416	19379.3
7. Utility Reconstruction	6/25/2013	8/29/2013	65	3.0	3.9	41.7	10.0	0.9	0.9	0.0	0.5	0.5	0.0	6678.1	6/25/2014	8/29/2014	65	3.0	3.467	37.33	8.989	0.897	0.897	0	0.507	0.507	0	6679.53
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	3.9	13.5	51.6	2.5	2.5	0.0	2.2	2.2	0.0	5267.2	10/2/2014	10/14/2014	12	0.5	3.562	12.47	49.12	2.229	2.229	0	1.944	1.944	0	5258.74
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	5.7	47.4	31.5	1.7	1.7	0.0	1.3	1.3	0.0	8918.8	10/2/2014	10/14/2014	12	0.5	5.234	43.12	28.97	1.609	1.609	0	1.163	1.163	0	8921.11
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.4	2.5	6.3	0.3	0.3	0.0	0.3	0.3	0.0	796.1	10/20/2014	10/30/2014	10	0.5	0.331	2.337	5.75	0.248	0.248	0	0.215	0.215	0	795.193

Construction Phase	Project D																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	6/4/2013	20	0.9	6.1	29.0	81.0	33.1	3.1	30.0	9.1	2.8	6.2	7108.7	5/15/2014	6/4/2014	20	0.9	5.879	28.8	77.9	32.95	2.949	30	8.92	2.68	6.24	7211.14
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	11.6	78.1	105.1	5.0	5.0	0.0	4.2	4.2	0.0	14545.3	5/15/2014	6/14/2014	30	1.4	10.86	73.77	99.6	4.711	4.711	0	4.016	4.016	0	14546.2
3. Levee Degrading/ Work Surface Construction	6/12/2013	6/27/2013	15	0.7	26.1	118.6	321.6	13.7	13.7	0.0	12.6	12.6	0.0	26635.7	6/12/2014	6/22/2014	10	0.5	25.02	118.4	307.1	13	13	0	11.92	11.92	0	26734

4. Cutoff Wall Construction	7/2/2013	8/16/2013	45	2.0	9.4	52.3	99.4	5.0	5.0	0.0	4.6	4.6	0.0	10477.3	7/2/2014	8/1/2014	30	1.4	8.717	52.05	92.28	4.52	4.52	0	4.151	4.151	0	10524.1
5. Levee Reconstruction/ Seepage Berm Construction	8/1/2013	9/15/2013	45	2.0	25.9	110.5	300.4	13.9	13.9	0.0	12.8	12.8	0.0	23488.8	7/31/2014	9/14/2014	45	2.0	25.03	110.4	287.9	13.3	13.3	0	12.23	12.23	0	23482.2
6. Borrow Site Excavation	8/1/2013	9/15/2013	45	2.0	5.5	26.2	129.3	6.0	4.0	2.0	3.2	3.2	0.4	18268.7	7/31/2014	9/14/2014	45	2.0	4.324	21.32	119.9	5.104	3.104	2	2.756	2.34	0.416	18235
7. Utility Reconstruction	7/13/2013	9/16/2013	65	3.0	3.9	41.7	10.0	0.9	0.9	0.0	0.5	0.5	0.0	6678.1	7/14/2014	9/17/2014	65	3.0	3.467	37.33	8.989	0.897	0.897	0	0.507	0.507	0	6679.53
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	3.9	13.5	51.6	2.5	2.5	0.0	2.2	2.2	0.0	5267.2	10/2/2014	10/14/2014	12	0.5	3.467	37.33	8.989	0.897	0.897	0	0.507	0.507	0	6679.53
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	5.7	47.4	31.5	1.7	1.7	0.0	1.3	1.3	0.0	8918.8	10/2/2014	10/14/2014	12	0.5	5.234	43.12	28.97	1.609	1.609	0	1.163	1.163	0	8921.11
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.5	2.8	8.4	0.4	0.4	0.0	0.3	0.3	0.0	1113.7	10/20/2014	10/30/2014	10	0.5	0.384	2.571	7.679	0.295	0.295	0	0.247	0.247	0	1112.2

Alternative 2 Construction Schedule and Daily Output

Construction Phase	Project A																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	14.5	70.6	181.6	47.1	7.1	40.0	14.9	6.6	8.3	15581.0	5/15/2015	6/4/2015	20	0.9	14.32	70.57	177.3	46.98	6.984	40	14.7	6.424	8.3	15576
2. Borrow Site Preparation	5/15/2014	6/6/2014	22	1.0	7.8	39.2	95.9	4.1	4.1	0.0	3.7	3.7	0.0	8465.8	5/15/2015	6/14/2015	30	1.4	7.666	39.22	92.89	3.929	3.929	0	3.6134	3.613	0.0	8462.1
3. Levee Degrading/ Work Surface Construction	6/12/2014	6/22/2014	10	0.5	4.3	20.4	50.6	2.3	2.3	0.0	2.1	2.1	0.0	4409.3													0.0	
4. Cutoff Wall Construction	6/26/2014	7/6/2014	10	0.5	3.9	22.5	41.0	2.0	2.0	0.0	1.9	1.9	0.0	4466.4													0.0	
5. Levee Reconstruction/ Seepage Berm Construction	6/12/2014	9/10/2014	90	4.1	46.9	212.2	561.6	24.2	24.2	0.0	22.2	22.2	0.0	46256.5	6/12/2015	9/10/2015	90	4.1	46.33	212.1	549.1	23.68	23.68	0	21.786	21.79	0.0	46241
6. Borrow Site Excavation	6/16/2014	9/14/2014	90	4.1	10.6	53.1	291.6	9.8399	7.8	2.0	6.4	5.9	0.4	44898.3	6/26/2015	9/14/2015	80	3.6	10.36	52.1	293.5	7.783	7.783	0	6.1	5.733	0.4	49362
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	3.0	15.4	35.1	1.4	1.4	0.0	1.3	1.3	0.0	3254.2	7/14/2015	9/12/2015	60	2.7	3.39	15.43	38.36	1.813	1.813	0	1.6658	1.666	0	3254
8. Levee Resurfacing																												
9. Hydroseeding	10/20/2014	10/30/2014	10	0.5	2.2	8.6	25.2	1.0	1.0	0.0	0.9	0.9	0.0	2840.8	10/16/2015	10/26/2015	10	0.5	2.167	8.602	24.39	0.932	0.932	0	0.857	0.857	0	2841.2
10. Demobilization/Cleanup	10/16/2014	10/28/2014	12	0.5	0.3	2.1	4.1	0.2	0.2	0.0	0.2	0.2	0.0	531.0	10/16/2015	10/26/2015	10	0.5	0.274	2.127	3.915	0.197	0.197	0	0.176	0.176	0	529.35

Construction Phase	Project B																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	17.9	76.9	220.3	69.1	9.1	60.0	20.8	8.3	12.5	18242.1	5/15/2015	6/4/2015	20	0.9	17.67	76.83	215.8	519.7	8.921	60	20.6	8.153	12.5	18324
2. Borrow Site Preparation	5/15/2014	6/4/2014	20	0.9	7.8	39.2	95.9	4.1	4.1	0.0	3.7	3.7	0.0	8465.8	5/15/2015	6/14/2015	30	1.4	7.666	39.22	92.89	3.929	3.929	0	3.6134	3.613	0.0	8462.1
3. Levee Degrading/ Work Surface Construction	6/12/2014	6/24/2014	12	0.5	4.6	21.5	59.7	2.5	2.5	0.0	2.3	2.3	0.0	5909.8	6/12/2015	6/22/2015	10	0.5	4.478	21.38	58.13	2.469	2.469	0	2.2182	2.218	0.0	5996.3
4. Cutoff Wall Construction	6/30/2014	7/30/2014	30	1.4	4.0	23.1	40.5	2.1	2.1	0.0	2.0	2.0	0.0	4469.1	6/26/2015	7/16/2015	20	0.9	3.808	23.04	38.89	2.016	2.016	0	1.8523	1.852	0.0	4484.3
5. Levee Reconstruction/ Seepage Berm Construction	6/12/2014	9/5/2014	85	3.9	46.0	206.6	551.0	23.7	23.7	0.0	21.8	21.8	0.0	45042.3	6/12/2015	8/6/2015	55	2.5	45.44	206.5	539	23.19	23.19	0	21.336	21.34	0.0	45038
6. Borrow Site Excavation	6/12/2014	9/12/2014	92	4.2	12.4	59.4	378.8	11.695	9.7	2.0	7.6	7.1	0.4	59761.6	6/26/2015	8/20/2015	55	2.5	16.45	77.4	550.8	13.67	13.67	0	10.0	9.603	0.4	96346
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	2.3	15.0	27.2	1.1	1.1	0.0	1.0	1.0	0.0	3196.2	7/14/2015	9/7/2015	55	2.5	2.725	14.99	30.67	1.498	1.498	0	1.3761	1.376	0	3196
X. Roadway Construction	9/20/2014	10/10/2014	20	0.9	3.4	12.9	35.1	2.0	2.0	0.0	1.8	1.8	0.0	2673.3	9/11/2015	10/1/2015	20	0.9	3.385	12.9	34.36	1.963	1.963	0	1.7949	1.795	0	2668.9
8. Levee Resurfacing																												
9. Hydroseeding	10/20/2014	10/28/2014	8	0.4	2.2	8.6	25.2	1.0	1.0	0.0	0.9	0.9	0.0	2840.8	9/11/2015	9/21/2015	10	0.5	2.167	8.602	24.39	0.932	0.932	0	0.857	0.857	0	2841.2
10. Demobilization/Cleanup	10/9/2014	10/19/2014	10	0.5	0.3	2.1	3.8	0.2	0.2	0.0	0.2	0.2	0.0	478.2	8/28/2015	9/7/2015	10	0.5	0.267	2.093	3.625	0.19	0.19	0	0.1713	0.171	0	477.09

Construction Phase	Project C																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	5/25/2013	10	0.5	33.0	153.4	547.9	169.5	19.5	150.0	48.0	16.8	31.2	61385.5	5/15/2014	6/4/2014	20	0.9	27.78	133.8	443.2	165.2	15.22	150	44.4	13.25	31.2	49419
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	8.2	39.3	100.9	4.3	4.3	0.0	4.0	4.0	0	8466.5	5/15/2014	6/14/2014	30	1.4	7.84	39.24	95.87	4.069	4.069	0	3.7418	3.742	0	8465.8
3. Levee Degrading/ Work Surface Construction	5/21/2013	5/31/2013	10	0.5	34.2	154.7	550.8	20.7	20.7	0.0	17.9	17.9	0	61392.3	6/12/2014	6/22/2014	10	0.5	28.79	135.1	445.2	16.34	16.34	0	14.273	14.27	0	49426
4. Cutoff Wall Construction	5/30/2013	6/14/2013	15	0.7	6.0	33.2	63.2	3.2	3.2	0.0	2.9	2.9	0	6591.0	6/26/2014	7/6/2014	10	0.5	5.546	33.07	58.66	2.894	2.894	0	2.6595	2.659	0	6611.8
5. Levee Reconstruction/ Seepage Berm Construction	5/23/2013	9/10/2013	110	5.0	25.9	110.5	300.1	13.9	13.9	0.0	12.8	12.8	0	23441.2	6/12/2014	8/21/2014	70	3.2	25.03	110.4	287.8	13.3	13.3	0	12.232	12.23	0	23466
6. Borrow Site Excavation	5/23/2013	9/10/2013	110	5.0	14.9	68.3	384.8	11.885	11.9	0.0	9.6	9.2	0.416	56547.1	6/26/2014	9/4/2014	70	3.2	16.21	74.77	541.9	15.38	13.38	2	10.0	9.63	0.416	87094
7. Utility Reconstruction	6/24/2013	8/28/2013	65	3.0	0.5	2.8	5.7	0.3	0.3	0.0	0.3	0.3	0.0	599.2	7/14/2014	9/17/2014	65	3.0	0.451	2.808	5.259	0.254	0.254	0	0.2333	0.233	0	599.19
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	6.8	22.8	76.5	4.1	4.1	0.0	3.7	3.7	0.0	6484.3	10/2/2014	10/14/2014	12	0.5	6.453	21.96	73.64	3.864	3.864	0	3.4701	3.47	0	6475.6
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	2.4	8.6	27.3	1.1	1.1	0.0	1.0	1.0	0.0	2839.9	10/2/2014	10/14/2014	12	0.5	2.218	8.601	25.24	0.967	0.967	0	0.8896	0.89	0	2840.8
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.4	2.5	6.3	0.3	0.3	0.0	0.3	0.3	0.0	796.1	10/20/2014	10/30/2014	10	0.5	0.331	2.337	5.75	0.248	0.248	0	0.2146	0.215	0	795.19

Construction Phase	Project D																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	6/4/2013	20	0.9	8.1	32.7	89.0	53.733	3.7	50.0	13.7	3.3	10.4	8872.9	4/29/2014	5/19/2014	20	0.9	7.416	31.43	84.37	53.38	3.382	50	13.4	3.008	10.4	8865.4
2. Borrow Site Preparation	5/15/2013	6/4/2013	20	0.9	8.2	39.3	100.9	4.3	4.3	0.0	4.0	4.0	0.0	8466.5	4/29/2014	5/29/2014	30	1.4	7.84	39.24	95.87	4.069	4.069	0	3.7418	3.742	0	8465.8

3. Levee Degrading/ Work Surface Construction																											
4. Cutoff Wall Construction																											
5. Levee Reconstruction/ Seepage Berm Construction	6/12/2013	9/13/2013	93	4.2	24.6	102.8	284.8	13.1	13.1	0.0	12.1	12.1	0.0	21960.8	5/27/2014	8/27/2014	92	4.2	23.77	102.8	273.5	12.57	12.57	0	11.559	11.56	0	21954
6. Borrow Site Excavation	6/12/2013	9/13/2013	93	4.2	4.5	21.1	108.9	3.387	3.4	0.0	3.1	2.7	0.4	15620.4	6/10/2014	9/10/2014	92	4.2	3.495	16.94	101.9	4.607	2.607	2	2.4	1.94	0.416	15763
7. Utility Reconstruction	7/12/2013	9/15/2013	65	3.0	0.5	2.8	5.7	0.3	0.3	0.0	0.3	0.3	0.0	599.2	6/26/2014	8/30/2014	65	3.0	0.451	2.808	5.259	0.254	0.254	0	0.2333	0.233	0	599.19
8. Levee Resurfacing																											
9. Hydroseeding	10/21/2013	11/2/2013	12	0.5	2.4	8.6	27.3	1.1	1.1	0.0	1.0	1.0	0.0	2839.9	10/16/2014	10/28/2014	12	0.5	2.218	8.601	25.24	0.967	0.967	0	0.8896	0.89	0	2840.8
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.5	2.8	8.4	0.4	0.4	0.0	0.3	0.3	0.0	1113.7	10/2/2014	10/12/2014	10	0.5	0.384	2.571	7.679	0.295	0.295	0	0.2474	0.247	0	1112.2

Alternative 3 Construction Schedule and Daily Output

Construction Phase	Project A																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2014	6/4/2014	20	0.9	14.6	71.2	186.4	27.3	7.3	20.0	10.8	6.7	4.2	16373.5	5/15/2015	6/4/2015	20	0.9	14.44	71.08	181.6	27.1	7.088	20.0	10.7	6.494	4.2	16359.8
2. Borrow Site Preparation	5/15/2014	6/14/2014	30	1.4	3.9	19.6	47.9	2.0	2.0	0.0	1.9	1.9	0.0	4232.9	5/15/2015	6/14/2015	30	1.4	3.833	19.61	46.45	2.2	1.965	0.0	2.0	1.807	0.0	4231.04
3. Levee Degrading/ Work Surface Construction	6/12/2014	8/1/2014	50	2.3	26.5	125.5	325.0	13.7	13.7	0.0	12.6	12.6	0.0	28132.3	6/12/2015	8/1/2015	50	2.3	26.13	125.4	316.8	16.4	13.42	0.0	14.6	12.32	0.0	28115.2
4. Cutoff Wall Construction	7/14/2014	8/18/2014	35	1.6	6.6	38.9	68.2	3.5	3.5	0.0	3.2	3.2	0.0	7676.9	7/14/2015	8/8/2015	25	1.1	6.321	38.79	65.35	6.2	3.279	0.0	5.7	3.011	0.0	7726.8
5. Levee Reconstruction/ Seepage Berm Construction	8/13/2014	9/17/2014	35	1.6	35.0	159.8	422.7	18.0	18.0	0.0	16.5	16.5	0.0	35040.6	8/13/2015	9/7/2015	25	1.1	34.53	159.8	413.3	12.0	17.59	0.0	11.1	16.18	0.0	35065.2
6. Borrow Site Excavation	8/13/2014	9/7/2014	25	1.1	6.0	29.9	172.6	7.6	4.6	3.0	4.1	3.4	0.6	26847.5	8/13/2015	9/7/2015	25	1.1	5.451	27.26	157.2	7.1	4.14	3.0	3.7	3.035	0.6	26562.2
7. Utility Reconstruction	7/14/2014	9/17/2014	65	3.0	3.0	15.4	35.1	1.4	1.4	0.0	1.3	1.3	0.0	3254.2	7/14/2015	9/17/2015	65	3.0	3.39	15.43	38.36	1.8125	1.813	0	1.666	1.666	0	3253.96
8. Levee Resurfacing	10/1/2014	10/13/2014	12	0.5	3.1	10.6	33.7	1.9	1.9	0.0	1.7	1.7	0.0	2722.7	9/17/2015	9/29/2015	12	0.5	3.141	10.6	33.69	1.8562	1.856	0	1.682	1.682	0	2722.67
9. Hydroseeding	9/17/2014	9/29/2014	12	0.5	2.2	8.6	25.2	1.0	1.0	0.0	0.9	0.9	0.0	2840.8	9/17/2015	9/29/2015	12	0.5	2.167	8.602	24.39	0.9315	0.932	0	0.857	0.857	0	2841.18
10. Demobilization/Cleanup	10/3/2014	10/18/2014	15	0.7	0.3	2.1	3.8	0.2	0.2	0.0	0.2	0.2	0.0	478.2	10/5/2015	10/20/2015	15	0.7	0.267	2.093	3.625	0.1898	0.19	0	0.171	0.171	0	477.089

Construction Phase	Project B																										
	2014														2015												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	4/29/2014	5/19/2014	20	0.9	21.8	94.6	365.9	32.6	12.6	20.0	15.0	10.8	4.2	42176.1	4/29/2015	5/19/2015	20	0.9	21.54	93.95	364	32.5	12.46	20.0	14.7	10.55	4.2	45027.9
2. Borrow Site Preparation	4/29/2014	5/29/2014	30	1.4	3.9	19.6	47.9	2.0	2.0	0.0	1.9	1.9	0.0	4232.9	4/29/2015	5/29/2015	30	1.4	3.833	19.61	46.45	2.2	1.965	0.0	2.0	1.807	0.0	4231.04
3. Levee Degrading/ Work Surface Construction	5/27/2014	6/21/2014	25	1.1	30.6	143.7	475.1	17.4	17.4	0.0	15.2	15.2	0.0	52806.1	5/27/2015	6/16/2015	20	0.9	30.12	143	469.6	16.4	17.06	0.0	14.6	14.78	0.0	55655.6
4. Cutoff Wall Construction	6/10/2014	7/30/2014	50	2.3	6.6	39.9	69.5	3.4	3.4	0.0	3.1	3.1	0.0	8049.3	6/26/2015	7/26/2015	30	1.4	6.288	39.8	66.5	6.2	3.218	0.0	5.7	2.955	0.0	8098.07
5. Levee Reconstruction/ Seepage Berm Construction	7/10/2014	8/24/2014	45	2.0	35.0	159.8	422.7	18.0	18.0	0.0	16.5	16.5	0.0	35045.9	7/28/2015	9/6/2015	40	1.8	34.53	159.8	413.3	12.0	17.59	0.0	11.1	16.18	0.0	35065.2
6. Borrow Site Excavation	7/10/2014	9/3/2014	55	2.5	7.3	35.4	218.8	6.7	5.7	1.0	4.4	4.2	0.2	34442.6	7/28/2015	9/6/2015	40	1.8	8.253	39.66	264.5	7.7	6.7	1.0	5.0	4.769	0.2	45897.9
7. Utility Reconstruction	6/26/2014	8/30/2014	65	3.0	3.0	15.4	35.1	1.4	1.4	0.0	1.3	1.3	0.0	3254.2	6/26/2015	8/30/2015	65	3.0	3.39	15.43	38.36	1.8125	1.813	0	1.666	1.666	0	3253.96
8. Levee Resurfacing	9/11/2014	9/23/2014	12	0.5	3.2	10.7	34.3	1.9	1.9	0.0	1.7	1.7	0.0	2828.3	9/22/2015	10/2/2015	10	0.5	3.139	10.68	34.36	1.8617	1.862	0	1.678	1.678	0	2974.36
9. Hydroseeding	9/25/2014	10/5/2014	10	0.5	2.2	8.6	25.2	1.0	1.0	0.0	0.9	0.9	0.0	2840.8	9/22/2015	10/2/2015	10	0.5	2.167	8.602	24.39	0.9315	0.932	0	0.857	0.857	0	2841.18
10. Demobilization/Cleanup	10/9/2014	10/19/2014	10	0.5	0.3	2.1	3.8	0.2	0.2	0.0	0.2	0.2	0.0	478.2	10/6/2015	10/14/2015	8	0.4	0.267	2.093	3.625	0.1898	0.19	0	0.171	0.171	0	477.089

Construction Phase	Project C																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	6/4/2013	20	0.9	10.8	49.8	187.3	46.6	6.6	40	13.9	5.6	8.32	21795.4	5/15/2014	6/4/2014	20	0.9	9.894	47.04	187.7	45.915	5.915	40	13.25	4.934	8.32	23720.1
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	4.1	19.6	50.4	2.2	2.2	0	2.0	2.0	0	4233.2	5/15/2014	6/14/2014	30	1.4	3.92	19.62	47.93	2.0345	2.035	0	1.871	1.871	0	4232.91
3. Levee Degrading/ Work Surface Construction	5/24/2013	6/13/2013	20	0.9	29.2	132.2	408.0	16.4	16.4	0	14.6	14.6	0	39738.9	5/26/2014	6/10/2014	15	0.7	27.5	129.4	397.9	15.193	15.19	0	13.47	13.47	0	41659.8
4. Cutoff Wall Construction	6/4/2013	7/9/2013	35	1.6	11.7	64.4	123.2	6.2	6.2	0	5.7	5.7	0	12873.0	6/4/2014	6/29/2014	25	1.1	10.84	64.15	114.5	5.6121	5.612	0	5.155	5.155	0	12914.4
5. Levee Reconstruction/ Seepage Berm Construction	7/4/2013	9/7/2013	65	3.0	22.6	100.0	267.0	12.0	12.0	0	11.1	11.1	0	21454.3	7/3/2014	9/6/2014	65	3.0	21.68	99.95	255	11.457	11.46	0	10.54	10.54	0	21449.4
6. Borrow Site Excavation	7/4/2013	9/7/2013	65	3.0	5.4	25.0	134.1	6.2	4.2	2	3.7	3.3	0.416	19432.2	7/3/2014	9/6/2014	65	3.0	4.1	19.62	124.1	5.1431	3.143	2	2.733	2.317	0.416	19408.1
7. Utility Reconstruction	6/25/2013	8/29/2013	65	3.0	0.5	2.8	5.7	0.3	0.3	0.0	0.3	0.3	0.0	599.2	6/25/2014	8/29/2014	65	3.0	0.451	2.808	5.259	0.2545	0.254	0	0.233	0.233	0	599.187
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	3.9	13.5	51.6	2.5	2.5	0.0	2.2	2.2	0.0	5267.2	10/2/2014	10/14/2014	12	0.5	3.562	12.47	49.12	2.2294	2.229	0	1.944	1.944	0	5258.74
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	2.4	8.6	27.3	1.1	1.1	0.0	1.0	1.0	0.0	2839.9	10/2/2014	10/14/2014	12	0.5	2.218	8.601	25.24	0.967	0.967	0	0.89	0.89	0	2840.77
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.4	2.5	6.3	0.3	0.3	0.0	0.3	0.3	0.0	796.1	10/20/2014	10/30/2014	10	0.5	0.331	2.337	5.75	0.2479	0.248	0	0.215	0.215	0	795.193

Construction Phase	Project D																										
	2013														2014												
	Schedule							PM10			PM2.5				Schedule							PM10			PM2.5			
	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2	Start	End	Days	Mo	ROG	CO	NOx	Tot	Ex	FD	Tot	Ex	FD	CO2
1. Clearing and Grubbing/ Stripping	5/15/2013	5/25/2013	10	0.5	6.3	29.7	85.2	63.3	3.3	60	15.4	2.9	12.48	7744.0	5/15/2014	5/25/2014	10	0.5	5.967	29.19	81.11	63.027	3.027	60	15.21	2.735	12.48	7739.48
2. Borrow Site Preparation	5/15/2013	6/14/2013	30	1.4	8.2	39.3	100.9	4.3	4.3	0	4.0	4.0	0	8466.5	5/15/2014	6/14/2014	30	1.4	7.84	39.24	95.87	4.069	4.069	0	3.742	3.742	0	8465.81
3. Levee Degrading/ Work Surface Construction	5/29/2013	6/8/2013	10	0.5	26.2	119.3	325.8	13.8	13.8	0	12.7	12.7	0	27271.0	5/29/2014	6/8/2014	10	0.5	25.1	118.8	310.3	13.074	13.07	0	11.98	11.98	0	27262.4

4. Cutoff Wall Construction	6/12/2013	7/27/2013	45	2.0	9.4	52.2	99.3	5.0	5.0	0	4.6	4.6	0	10466.7	6/12/2014	7/7/2014	25	1.1	8.723	52.08	92.5	4.5256	4.526	0	4.155	4.155	0	10561.1
5. Levee Reconstruction/ Seepage Berm Construction	7/11/2013	9/9/2013	60	2.7	25.9	110.5	300.4	13.9	13.9	0	12.8	12.8	0	23483.5	7/10/2014	9/8/2014	60	2.7	25.03	110.4	287.9	13.302	13.3	0	12.23	12.23	0	23476.9
6. Borrow Site Excavation	7/11/2013	9/9/2013	60	2.7	4.5	22.0	102.5	5.2	3.2	2	3.0	2.6	0.416	14192.1	7/10/2014	9/8/2014	60	2.7	3.663	18.4	95.26	4.5141	2.514	2	2.342	1.926	0.416	14179.8
7. Utility Reconstruction	6/28/2013	9/1/2013	65	3.0	0.5	2.8	5.7	0.3	0.3	0.0	0.3	0.3	0.0	599.2	6/30/2014	9/3/2014	65	3.0	0.451	2.808	5.259	0.2545	0.254	0	0.233	0.233	0	599.187
8. Levee Resurfacing	10/3/2013	10/15/2013	12	0.5	3.9	13.5	51.6	2.5	2.5	0.0	2.2	2.2	0.0	5267.2	10/2/2014	10/14/2014	12	0.5	3.562	12.47	49.12	2.2294	2.229	0	1.944	1.944	0	5258.74
9. Hydroseeding	10/3/2013	10/15/2013	12	0.5	2.4	8.6	27.3	1.1	1.1	0.0	1.0	1.0	0.0	2839.9	10/2/2014	10/14/2014	12	0.5	2.218	8.601	25.24	0.967	0.967	0	0.89	0.89	0	2840.77
10. Demobilization/Cleanup	10/21/2013	10/31/2013	10	0.5	0.5	2.8	8.4	0.4	0.4	0.0	0.3	0.3	0.0	1113.7	10/20/2014	10/30/2014	10	0.5	0.384	2.571	7.679	0.2945	0.295	0	0.247	0.247	0	1112.2

Appendix E

Greenhouse Gas Calculation Spreadsheets and Supporting Information

GREENHOUSE GAS APPENDIX

CACULATION SPREADSHEETS AND

SUPPORTING INFORMATION

Comparison of Project Total GHG Emissions

Emission Category	GHG Constituent Tons			GHG, CO2-Eq Tons			
	CO2	CH4	N2O	CO2	CH4	N2O	CO2-EQ
ALTERNATIVE 1							
Off-Road Equipment	15,076	3.0	0.20	15,076	63	0.20	15,139
On-Road Vehicles	9,131	0	--	9,131	7	--	9,137
Total	24,206	3.3	0.20	24,206	70	0.20	24,276
Levee Project Lifetime, years							50
Annualized GHG Emissions, tons CO2-eq per year							486
ALTERNATIVE 2							
Off-Road Equipment	18,930	3.8	0.25	18,930	79	0.25	19,010
On-Road Vehicles	19,022	1	--	19,022	12	--	19,034
Total	37,952	4.4	0.25	37,952	92	0.25	38,044
Levee Project Lifetime, years							50
Annualized GHG Emissions, tons CO2-eq per year							761
ALTERNATIVE 3							
Off-Road Equipment	16,788	3.4	0.22	16,788	71	0.22	16,859
On-Road Vehicles	9,547	0	--	9,547	7	--	9,554
Total	26,335	3.7	0.22	26,335	78	0.22	26,413
Levee Project Lifetime, years							50
Annualized GHG Emissions, tons CO2-eq per year							528

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Default Construction Equipment Factors from Sacramento Roadway Construction Emission Model

Equipment	d Factor Default Values			g/hp-hr	Vehicle	
	HP	Load Factor	Hrs/Day		CO2	CH4
Bore/Drill Rigs	291	0.75	8	427	N/A	N/A
Cement and Mortar Mixers	10	0.56	8	319	N/A	N/A
Cranes	399	0.43	8	245	N/A	N/A
Excavators	168	0.57	8	324	N/A	N/A
Generator Sets	549	0.74	8	421	N/A	N/A
Graders	174	0.61	8	347	N/A	N/A
Off-Highway Tractors	267	0.65	8	370	N/A	N/A
Off-Highway Trucks	479	0.57	8	324	N/A	N/A
Rollers	95	0.56	8	319	N/A	N/A
Rough Terrain Forklifts	93	0.60	8	336	N/A	N/A
Rubber Tired Dozers	357	0.59	8	336	N/A	N/A
Rubber Tired Loaders	157	0.54	8	307	N/A	N/A
Scrapers	313	0.72	8	410	N/A	N/A
Water Trucks	120	0.75	8	324	N/A	N/A
Commute Vehicles	N/A	N/A	N/A	N/A	426.7	0.018
Heavy Duty Trucks	N/A	N/A	N/A	N/A	1880	0.038

Alternative 1: Off-Road Equipment GHG Emissions and Annual Fuel Usage

	Project A										Project B										Project C										Project D										Project-Wide Fuel Usage					
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10						
Equipment	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Days	Project Pieces*Days	Project HP-hr	CO2 EF g/hp-hr	Project CO2 Tons/yr	BSFC hp-hr/gal	Project Gallons
Aerial Lifts			0																																						20	0	0			20	0
Air Compressors																																									20	0	0			20	0
Bore/Drill Rigs				1										1										2										2							20	380	663,919	426.6	312	20	33,196
Cement and Mortar Mixers				2										2										4										3							20	685	31,674	318.5	11	20	1,584
Cranes							2										2																								20	460	631,535	244.6	170	20	31,577
Excavators			3	5		2	2						3	4		2	2						3	8			1						3	6			1			20	2,970	2,276,378	324.2	813	20	113,819
Generator Sets				4										4										6										5							20	1,175	3,820,263	420.9	1,771	20	191,013
Graders					2			2							2			2							2			2							5			2			20	1,170	991,817	346.9	379	20	49,591
Off-Highway Tractors		2										2										2			5			2				4			5					20	1,620	2,249,067	369.7	916	20	112,453
Off-Highway Trucks			7	3										3									7	3				2					7	3			1	2			20	1,661	3,627,557	324.2	1,295	20	181,378
Other Construction Equipment				1																																					20	60	22,228	352.7	9	20	1,111
Rollers			5		5			2					5		5				2				5		4			2					5			5			2			20	2,750	1,175,307	318.5	412	20	58,765
Rough Terrain Forklifts										1				1						1				1						1				1						1	20	258	115,676	335.6	43	20	5,784
Rubber Tired Dozers											2																														20	80	134,825	335.6	50	20	6,741
Rubber Tired Loaders	4	0		2		2	2							2		2					2			4		2					2			3						20	2,195	1,488,723	307.1	504	20	74,436
Scrapers	8	2	15		20						8	2	15		20						4	2	14		10	0					3	4	14		10						20	8,920	16,056,152	409.5	7,241	20	802,808
Water Trucks	2	1	3	2	3	2	2	1	2		2	1	3	2	3	2	2	1	2		2	1	4	2	3	2	1	1	2		2	2	3	2	3	3	1	1	2		20	4,477	3,223,440	324.2	1,151	20	161,172
Construction Days	20	20	40	60	60	60	100	22	18	18	40	60	80	50	80	80	130	20	20	15	40	60	35	60	130	130	130	24	24	20	40	60	25	75	90	90	130	24	24	20					15,076		1,825,428

Activity Codes:

1 - Clearing/Grubbing

2 - Borrow Site Preparation

3 - Levee Degrading

4 - Cutoff Wall Construction

5 - Levee Reconstruction

6 - Borrow Site Excavation and Hauling

7 - Utility Reconstruction

8 - Levee Resurfacing

9 - Hydorseeding

10 - Demobilization/Cleanup

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ALTERNATIVE 1: ON-ROAD VEHICLE EMISSIONS

Trip Type	Project A				Project B				Project C				Project D				Combined Projects				
Workers	79				76				102				102								
Duration, Days	418				575				653				578								
Round Trip Dist., miles	60				60				60				60								
Worker Vehicle Miles	1,986,336				2,618,550				4,008,114				3,547,764								
Vehicle Type	Total CY	Truck Load	Trips	Round Trip Miles	Total CY	Truck Load	Trips	Round Trip Miles	Total CY	Truck Load	Trips	Round Trip Miles	Total CY	Truck Load	Trips	Round Trip Miles	VMT	CO2 EF, g/mi	CO2 Tons	CH4 EF, g/mi	CH4 Tons
Worker Commute																	12,160,764	426.7	5,715	0.018	0.241
Unsuitable Soil Disposal, cy	31500	12	2625	3	520,250	12	43,354	3	253,000	12	21,083	3	14,000	12	1,167	3	204,688	1880	424	0.038	0.009
Bentonite			89	26			119	16			191	12			197	36	13,602	1880	28	0.038	0.001
Aggregate Surfacing			425	36			400	26			1,500	20			1,500	28	97,700	1880	202	0.038	0.004
Pipe Material			8	36			17	16			31	12			44	28	2,164	1880	4	0.038	0.000
Demolition Debris			60	36			36	16			160	12			275	28	12,356	1880	26	0.038	0.001
CLSM Backfill			26	36			36	16			104	12			76	28	4,888	1880	10	0.038	0.000
Borrow Fill, cy	244,000	12	20,333	6	796,750	12	66,396	6	531,000	12	44,250	8	330,000	12	27,500	16	1,314,375	1880	2,721	0.038	0.055
TOTALS																			9,131		0.310

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Alternative 2: OffRoad Equipment GHG Emissions and Fuel Usage

	Project A										Project B										Project C										Project D										Combined Projects GHG Emissions and Fuel Usage					
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	Project	Project	CO2 EF	Project CO2	Avg BSFC	Project
Equipment	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No*Days	HP-hr	g/hp-hr	Tons/yr	hp-hr/gal	Gallons
Bore/Drill Rigs				1																				1										0							35	61,150	426.6	29	20	3,058
Cement and Mortar Mixers				1										2										2										0							160	7,398	318.5	3	20	370
Cranes							2										2																								490	672,722	244.6	181	20	33,636
Excavators			1	2	2	4	2						1	4		2	2						3	4			1						0	0			1				2,492	1,910,012	324.2	682	20	95,501
Generator Sets				2										2										3										0							195	634,001	420.9	294	20	31,700
Graders					5			1							5			2	2						2			4							5			2			3,179	2,694,860	346.9	1,030	20	134,743
Off-Highway Tractors		4										4										4			5							4			2					2,038	2,829,382	369.7	1,152	20	141,469
Off-Highway Trucks			7	2									6	2					1				7	2			1	2				0	0			1	2			888	1,939,356	324.2	692	20	96,968
Other Construction Equipment				1																																				10	3,705	352.7	1	20	185
Rollers			2		5			1					2		5			3	1				5		5			4				0		5			2			3,903	1,668,081	318.5	585	20	83,404
Rough Terrain Forklifts										1				1						1				1						1				0					1	147	65,909	335.6	24	20	3,295
Rubber Tired Dozers											4																							0						160	269,650	335.6	100	20	13,483
Rubber Tired Loaders	4	0		1		4	2							1		4	2				7			2		4					3			0		2				3,510	2,380,600	307.1	805	20	119,030
Scrapers	8	4	2		25						8	4	2		25						13	4	14		10	0					5	4	0		10						14,247	25,644,843	409.5	11,566	20	1,282,242
Water Trucks	2	2	2	1	4	4	2	1	2		2	2	1	1	4	4	2	1	1	2	7	2	4	1	3	4	1	2	2		3	2	0	0	3	2	1	1	2		6,949	5,003,280	324.2	1,786	20	250,164
Construction Days	40	22	10	10	180	170	115	5	20	22	40	50	22	50	145	145	130	40	20	15	40	60	20	25	180	180	130	24	24	20	40	60	0	0	185	185	130	24	24	15				18,930		2,289,247

Activity Codes:

1 - Clearing/Grubbing

2 - Borrow Site Preparation

3 - Levee Degrading

4 - Cutoff Wall Construction

5 - Levee Reconstruction

6 - Borrow Site Excavation and Hauling

7 - Utility Reconstruction

8 - Levee Resurfacing

9 - Hydorseeding

10 - Demobilization/Cleanup

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ALTERNATIVE 2: ON-ROAD VEHICLE EMISSIONS

Trip Type	Project A					Project B					Project C					Project D					Combined Projects				
Workers	132					129					135					102									
Duration, Days	594					657					693					663									
Round Trip Dist., miles	60					60					60					60									
Worker Vehicle Miles	4,704,480					5,073,354					5,625,774					4,069,494									
Vehicle Type	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	VMT	2014 CO2 EF, g/mi	CO2 Tons	CH4 EF, g/mi	CH4 Tons
Worker Commute					4704480					5,073,354					5,625,774					4,069,494	19,473,102	426.7	9,151	0.018	0.386
Unsuitable Soil Disposal, cy	75	12	6.25	3	19	22,000	12	1,833	3	5,500	322,900	12	26,908	3	80,725	29,000	12	2,417	3	7,250	93,494	1880	194	0.038	0.004
Bentonite			1	26	26			31	16	496			28	12	336			197	36	7,092	7,950	1880	16	0.038	0.000
Aggregate Surfacing			50	18	900			225	26	5,850			1,200	20	24,000			1,500	28	42,000	72,750	1880	151	0.038	0.003
Pipe Material			8	36	288			17	16	272			31	12	372			44	36	1,584	2,516	1880	5	0.038	0.000
Demolition Debris			60	36	2,160			36	16	576			160	12	1,920			275	36	9,900	14,556	1880	30	0.038	0.001
CLSM Backfill			26	36	936			36	16	576			104	12	1,248			76	36	2,736	5,496	1880	11	0.038	0.000
Borrow Fill, cy	1,628,000	12	135,667	6	814,000	2,334,500	12	194,542	6	1,167,250	2,681,200	12	223,433	8	1,787,467	601,500	12	50,125	16	802,000	4,570,717	1880	9,464	0.038	0.191
TOTALS																							19,022		0.586

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Off-Road Equipment GHG Emissions: Alternative 3

	Project A										Project B										Project C										Project D										Project-Wide GHG Emissions					
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	Equipment	Project	Equip CO2 EF	Project CO2	Avg BSFC	Project
Equipment	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Pieces*Days	HP-hr	g/hp-hr	Tons/yr	hp-hr/gal	Gallons
Bore/Drill Rigs				1										2										2										2							490	856,106	426.6	402	20	42,805
Cement and Mortar Mixers				2										2										4										3							745	34,449	318.5	12	20	1,722
Cranes							2										2																								520	713,909	244.6	192	20	35,695
Excavators			3	2		2	2						3	4		2	2						3	8			1						3	6			1				3,055	2,341,527	324.2	836	20	117,076
Generator Sets				4										4										6										5							1,295	4,210,417	420.9	1,952	20	210,521
Graders					2			2							2			2							2			2							5			2			1,188	1,007,076	346.9	385	20	50,354
Off-Highway Tractors		2										2										2			5							4			5					1,700	2,360,132	369.7	961	20	118,007
Off-Highway Trucks			7	3										3			2						7	3			1	2					7	3			1	2			2,345	5,121,385	324.2	1,829	20	256,069
Rollers			5		5			2					5		5		2						5		5			2					5		5			2			3,038	1,298,394	318.5	455	20	64,920
Rough Terrain Forklifts				1						1				1						1				1						1				1						1	357	160,064	335.6	59	20	8,003
Rubber Tired Dozers											4																														160	269,650	335.6	100	20	13,483
Rubber Tired Loaders	4	0		2		2	2							2		2	2				2			4		2					2			3		3				2,405	1,631,152	307.1	552	20	81,558
Scrapers	8	2	15		20						8	2	15		20						4	2	14		10	0					3	4	14		10					9,635	17,343,164	409.5	7,822	20	867,158
Water Trucks	2	1	3	2	3	2	2	1	2		2	1	3	2	3	2	2	1	2		2	1	4	2	3	2	1	1	2		2	2	3	2	3	3	1	1	2		4,793	3,450,960	324.2	1,232	20	172,548
Construction Period, Days	40	60	100	60	60	50	130	24	24	24	40	60	45	80	85	95	130	22	20	18	40	60	35	60	130	130	130	24	24	20	40	60	25	75	90	90	130	24	24	20	Project Total Emissions			16,788		2,039,919

Activity Codes:

1 - Clearing/Grubbing

2 - Borrow Site Preparation

3 - Levee Degrading

4 - Cutoff Wall Construction

5 - Levee Reconstruction

6 - Borrow Site Excavation and Hauling

7 - Utility Reconstruction

8 - Levee Resurfacing

9 - Hydorseeding

10 - Demobilization/Cleanup

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ON-ROAD VEHICLE EMISSIONS, ALTERNATIVE 3

Trip Type	Project A					Project B					Project C					Project D					Combined Project				
Workers	79.2					75.9					102.3					102.3									
Duration, Days	572					595					653					578									
Round Trip Dist., miles	60					60					60					60									
Worker Vehicle Miles	2,718,144					2,709,630					4,008,114					3,547,764									
Vehicle Type	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	Total CY	Truck Load	Trips	Round Trip Miles	Vehicle Miles	VMT	2014 CO2 EF, g/mi	CO2 Tons	CH4 EF, g/mi	CH4 Tons
Worker Commute					2,718,144					2,709,630					4,008,114					3,547,764	12,983,652	426.7	6,101	0.018	0.26
Unsuitable Soil Disposal, cy	25,750	12	2,146	3	6,438	520,250	12	43,354	3	130,063	253,100	12	21,092	3	63,275	14,000	12	1,167	3	3,500	203,275	1880	421	0.038	0.009
Bentonite			78	26	2,028			119	16	1,904			193	12	2,316			197	36	7,092	13,340	1880	28	0.038	0.001
Aggregate Surfacing			350	36	12,600			400	26	10,400			1,500	20	30,000			1,500	28	42,000	95,000	1880	197	0.038	0.004
Pipe Material			8	26	208			17	16	272			31	12	372			44	36	1,584	2,436	1880	5	0.038	0.000
Demolition Debris			60	26	1,560			36	16	576			160	12	1,920			275	36	9,900	13,956	1880	29	0.038	0.001
CLSM Backfill			26	26	676			36	16	576			104	12	1,248			76	36	2,736	5,236	1880	11	0.038	0.000
Borrow Fill, cy	276,250	12	23,021	6	138,125	796,750	12	66,396	6	398,375	531,300	12	44,275	8	354,200	330,100	12	27,508	16	440,133	1,330,833	1880	2,755	0.038	0.056
TOTALS																							9,547		0.33

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